



Emergency & Critical Care Strategy: Framework for Implementing Emergency & Critical Care Services in Malawi 2021-2031

Government of the Republic of Malawi
Ministry of Health
Lilongwe
November 2021



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Table of Contents

Acronyms	3
Acknowledgements.....	4
Foreword.....	5
Chapter 1: Introduction to Emergency and Critical Care	7
1.1 Global and national needs for emergency and critical care services	7
1.2 Goal and Objectives	12
1.3 Dimensions of Emergency Care	12
Chapter 2: Situation of Emergency and Critical Care Services in Malawi	14
2.1 Community health, scene, and secondary prevention.....	14
2.2 Transport.....	14
2.3 Emergency care in hospitals	15
2.4 Inpatient critical care	15
2.5 Staffing	16
2.6 Equipment and Maintenance	17
2.7 Medicines and medical supplies	17
2.8 Patient documentation and evaluation of care	18
2.9 Central and District Leadership and Management of hospitals	19
2.10 Financing Health Services in Malawi	19
Chapter 3: Strategic Intervention Areas	21
3.1 Intra-hospital Care	21
3.2 Out of hospital care- community health, family medicine and transport.....	29
3.3 Staffing and training for health workers for emergency and critical care services.....	31
3.4 Standard equipment: procurement and maintenance.....	38
3.5 Medicines, Medical supplies, and ordering systems	40
3.6 Information Systems and research	40
3.7. Governance, Leadership and Continuous Improvement.....	42
Chapter 4: Implementation Arrangements	47
4.1 Policy requirements	47
4.2 Policy strategy and guidelines revisions	47
Chapter 5: Financing the Strategy	51
Chapter 6. Monitoring and Evaluation	52
Annex 1: Implementation matrix.....	53

Annex 2: Contributors to the Strategy.....	63
Annex 3: Proposed staffing cadres	65
Annex 4: Basic equipment for hospitals	68
Annex 5: Cost estimate for ECCS implementation	71
Annex 6: Annual costs and population reached	72
Annex 7: Costing methods and assumptions.....	73

List of Figures

Figure 1: WHO Emergency and Trauma Care, 2018

Figure 2: Number of establishment positions that are filled by sub-cadre (public sector), taken from the Human Resources for Health Strategic Plan 2018-2022

Figure 3: Eight C's of Emergency and Critical Care

Figure 4: Principles of ward effective management

List of Tables

Table 1. Emergency Care and SDG Targets

Table 2: Pillars of ECCS mapped onto costed national policies and strategies

Acronyms

AETC	Accident and Emergency Treatment and Care
AFEM	African Federation of Emergency Medicine
C section	Caesarean section
CMST	Central Medical Stores
CO	Clinical Officer
CPAP	continuous positive airways pressure/ Bi-level continuous airway pressure
CPD	Continuous professional development
DHIS II	District health Information Software
DTC	Drug and Therapeutic committee
EC	Emergency care
ECCS	Emergency and critical care services
EM	Emergency medicine
EMR	Electronic medical record
ETAT	Emergency triage assessment and treatment
FBC	Full blood count
FiO2	Fraction of inspired Oxygen
GBV	Gender based violence
GIZ	Germany Development Cooperation
HDU	High dependency unit
HIC	High income countries
HIV	Human immune deficiency Virus
HSSP II	Health Sector Strategic Plan II
ICU	Intensive care unit
LMIC	Low and middle-income countries
LMIS	Logistic Management Information System
MoH	Ministry of Health
MVA	Manual vacuum aspiration
NASG	Non-pneumatic anti-shock garment
NCD	Non-communicable disease
NGO	Non-Governmental organisation
NMT	Nurse midwife technician
NO	Nursing officer
NSOAP	National Surgery, Obstetric and Anaesthesia Plan
OPD	Out-patient department
ORT	Other recurrent transactions
PAM	Physical Assets Management
PoC	Point of Care
R.I.P	Rest in peace
SDG	Sustainable Development Goals
TWG	Technical Working Group
UHC	Universal Health Coverage
WHO	World Health Organisation

Acknowledgements

The Emergency and Critical Care Strategy (ECCS) was commissioned by the Department of Curative and Medical Rehabilitation Services to fill the gap of comprehensive, high-quality services in prior policy and implementation of clinical services in Malawi. The aim of the ECCS is to save lives and prevent disability through provision of universal essential emergency care to all Malawians.

Developing the Emergency and Critical Care Strategy (2021-2031) has been a formidable task, which has been made possible by the commitment from many stakeholders involved in its inception and development. The Ministry of Health would like to express its profound gratitude to contributions. The strategy is the result of leadership and strategic direction with unwavering commitment from the Department of Curative and Medical Rehabilitation Services with concerted efforts from the Ministry of Health, other government institutions, development partners and other health stakeholders, non-governmental organizations (NGOs), health training institutions and health experts.

We would like to thank partners that funded or provided technical expertise to the process: German Development Cooperation (GIZ), Partners In Health (PIH), Newborn Essential Solutions and Technologies (NEST) and Luke International (Norway) for providing technical and financial assistance for development of this strategy. We appreciate the ELMA Foundation for providing financial support while USAID, ONSE project providing technical expertise in the development process of the strategy. We appreciate the provision of technical and implementation experience from the WHO and World Bank especially on out of hospital emergency care provision. Finally, we thank GIZ for providing financial and technical expertise for the conduct of the emergency and critical services assessment that has given important information needed in developing this strategy. The Ministry would also like to thank all experts, units and departments (see Annex 2) for contributing to the strategy.



Dr Charles Mwansambo
Secretary for Health

Foreword

This Emergency and Critical Care Strategy is the first of its kind in Malawi. Emergency and critical care is a vital part of the continuum of care and therefore a requirement to complete and set the context of the National Health Policy and the HSSP II. It touches the core of an efficient and effective health system. In developing this strategy, efforts have been made to be practical and realistic while also improving the scope and quality of care to achieve the objectives outlined in this strategy, but it will need more time and resources. The Emergency and Critical Care Strategy (ECCS) will therefore be implemented over a period of ten years as the development of emergency and critical care services will require more and focused investment in infrastructure, equipment, human resources as well as in clinical leadership and governance at all health service delivery levels.

Implementing this strategy will require reorganising resources and systems. In few places, it might require erecting new health facilities or remodelling the existing structures, but mostly it will require the remodelling of rooms to achieve the desired designs of the emergency units, theatres, HDUs and other related areas. One important complement of the ECCS is the Malawi National Medical Oxygen Ecosystem Scale-Up Roadmap, which aims to ensure equitable access to safe medical oxygen for all Malawians. The Oxygen roadmap with the ECCS provide stakeholders with a blueprint to implement cross cutting and horizontal health interventions that will ultimately reduce the burden and resulting mortality and morbidity of critical illness in Malawi. Therefore, this strategy is meant to be implemented in ten years, with a midterm evaluation after 5 years to adapt it based on the newly generated evidence and knowledge.

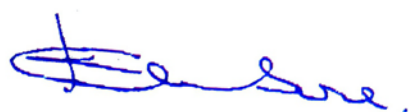
This strategy, which is comprehensive, has been developed at a time when the World Health Organisation is urging member states to strengthen Emergency and Critical Care services through the development of National Surgical Obstetric and Anaesthesia Plans (NSOAPs) as a way of working towards Universal Health Coverage. Data in the SADC region shows that over 30% of deaths occur due to sepsis and over 10% from acute respiratory illnesses whereas only 7% come from trauma.¹ Therefore, this strategy does not look only into unmet needs for trauma, surgical and obstetric care but integrates these interventions into a holistic approach to encompass all emergencies and critically ill patient needs.

The effective implementation of this strategy will benefit the country in achieving the health-related Sustainable Development Goals (SDGs). The strategy also gives an opportunity for Ministry of Health to make provisions for people living with disabilities as Malawi move towards attaining Universal Health Coverage in line with SDGs and agenda 2063.

¹ Institute for Health Metrics and Evaluation. GBD Compare: Global Burden of Disease Study. 2010.
<https://vizhub.healthdata.org/gbd-compare/>.

To achieve the objectives of this strategy, the Government of Malawi, will set high on its agenda the investment in better health care and shall work with all stakeholders including development partners and the private sector.

It is my expectation that it will henceforth become the point of reference for the design and integration of service delivery programmes across the continuum of care from the community level to tertiary level in all disciplines of medicine. In this way, Malawi shall achieve high quality health care services accessible by all its citizens.



Honourable Khumbize Kandodo Chiponda, MP
Minister of Health

Chapter 1: Introduction to Emergency and Critical Care

1.1 Global and national needs for emergency and critical care services

Emergencies in medicine are life threatening illnesses or events that require immediate attention in order to prevent permanent harm or death. Many emergencies are caused or aggravated by poverty, poor housing or unsafe working conditions, discrimination and conflicts. **Emergency care** is the actionable service response delivered to examine and stabilize a patient and prevent death or disability when emergencies occur. Emergency care is an essential part of universal access to health care and plays a vital role in linking patients to the health system. Patients present to facilities when they experience an emergency and sense danger of dying and disability. Emergency services is the care given to patients with serious reversible disease and it encompasses en route to the hospital, on arrival to hospital and the care of inpatients when in a critical state.² The system's readiness to respond to emergencies is a vital test for the effectiveness of a health system.

Emergencies can be caused by an acute accident, intoxication, mass casualty, natural catastrophe or an individual, epidemic or pandemic infectious disease or a non-communicable disease, or a crisis of a chronic condition. Emergency care involves the simultaneous stabilization, diagnosis and treatment of an undifferentiated patient. This means emergency care will:

- Recognize emergency and critical illnesses through a triage system, monitoring and early warning scores
- Stabilize the patient through life saving essential and emergency care
- Diagnose emergency and critical conditions through appropriate evaluation testing and reassessment
- Treat emergency and critical illnesses based on differential and definitive diagnoses.
- Determine the appropriate location for the patients ongoing care what could include a referral to a higher level of care, admission to a short stay unit, to theatre, to an inpatient ward, a High Dependence Unit or Intensive Care Unit or a discharge to the community level of care

Generally following emergencies, mortality rates are high in low and middle income countries due to weak emergency and critical care systems. Several studies have reported deficiencies throughout the care continuum for trauma, infectious diseases, seriously ill children and in emergency obstetric care in low-income countries.^{3,4,5} Over 90% of trauma deaths⁶ and 94% percent of global maternal mortality is in developing countries.⁷ With 75% of the 7.6 million children under 5 who die each year

²World Health Organization. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured. 2019 90% o

³Baker T, Lugazia E, Eriksen J, Mwafongo V, Irestedt L, Konrad D. Emergency and critical care services in Tanzania: a survey of ten hospitals. *BMC Health Serv Res* 2013; 13: 140.

⁴Abdu M, Wilson A, Mhango C, Taki F, Coomarasamy A, Lissauer D. Resource availability for the management of maternal sepsis in Malawi, other low-income countries, and lower-middle-income countries. *Int J Gynecol Obstet* 2018; 140: 175–83.

⁵Sonenthal PD, Masiye J, Kasomekera N, et al. COVID-19 preparedness in Malawi. *Lancet Glob Heal* 2020; 0.

⁶Aluisio AR, Waheed S, Cameron P, et al. Clinical emergency care research in low-income and middle-income countries: Opportunities and challenges. *BMJ Glob Heal* 2019; 4.

⁷WHO, UNICEF, UNFPA, World Bank Group and the UNPD. Trends in Maternal Mortality 2000 - 2017. Geneva, 2017 <https://apps.who.int/iris/bitstream/handle/10665/327596/WHO-RHR-19.23-eng.pdf?sequence=13&isAllowed=y>.

worldwide residing in Africa or Asia, 50% of child deaths in hospitals in developing countries occur within 24 hours of arriving at the facility.⁸

Emergency care is a health service that cross cuts traditional disease-focused disciplines and provides prompt interventions for many disease-specific emergencies, including pregnancy-related complications, communicable and non-communicable diseases, and injuries. Health systems in many countries are often fragmented and comprised of programmes with a narrow focus on disease-specific care. However, well organized emergency care appropriately distributed across a country allows for timely coordination of services and resources, and optimum efficiency and efficacy in treating a range of acute conditions, from out-of-hospital care at the scene of an injury or illness to treatment and stabilization in the emergency unit, and early operative and intensive care.⁹

A positive outcome for the patient depends on a timely and state-of-the-art response to an emergency. When needed the patient can then also be linked to the primary health care system after treatment of the emergency for follow up continuity of care, so that another emergency event is prevented. This is especially true as the disease burden of infectious and communicable diseases has decreased in the last years and the disease burden of stroke, ischaemic heart diseases and diabetes has increased. For example, if an emergency is due to a chronic condition like diabetes, hypertension and chronic heart disease or emergency due to toxic ingestion, the patient can be followed and receive treatment for the underlying illness or ingestion thus preventing an exacerbation. Baker et al states: “Emergency care services are often the first point of contact for many people around the world including pregnant mothers, children and neonates. When there are barriers to healthcare access, people present for care late and only when complicated with acute on chronic illness or injury. People who are ill or injured present to frontline providers responsible for the care of both children and adults with medical, surgical and obstetric emergencies, including injuries, communicable, non-communicable diseases, and complications of pregnancy”.¹⁰

While it is always better to prevent than to cure, emergencies happen even with the best preventive care and can result in death, disability, chronic suffering, and catastrophic expenditure by the families. It is only through integration of emergency and critical care services into the continuum of care that can we improve long term outcomes.

When considering systems and not specific diseases, emergency care is essential and cost-effective as reported during the 72th World Health Assembly:

More than half the deaths and around 40% of the total burden of disease in low- and middle-income countries result from conditions that could be treated with prehospital and emergency care. The lack of organized emergency care in many low- and middle income countries leads to wide discrepancies in outcomes across the range of emergency conditions. People with similar

⁸Lazzerini M, Seward N, Lufesi N, et al. Mortality and its risk factors in Malawian children admitted to hospital with clinical pneumonia, 2001-12: A retrospective observational study. *Lancet Glob Heal* 2016; 4: e57–68.

⁹Baker T, Lugazia E, Eriksen J, Mwafongo V, Irestedt L, Konrad D. Emergency and critical care services in Tanzania: a survey of ten hospitals. *BMC Health Serv Res* 2013; 13: 140.

¹⁰Schell CO, Gerdin Wärnberg M, Hvarfner A, et al. The global need for essential emergency and critical care. *Crit. Care*. 2018; 22: 284.

severe injuries, for example, are substantially more likely to die in a low-income setting than they are in a high-income setting. Overall mortality rates from diabetic ketoacidosis have been documented in several studies as less than 1% in high-income countries but up to 30% in some low- and middle-income countries...

...Implementing simple systematic processes can improve the quality of emergency care and save lives, even without input of other resources. For example, protocols that guide prehospital providers to transport patients to the most appropriate facility can reduce delays in giving life-saving treatment. Using a formal triage protocol in emergency units to prioritize care based on a patient's needs rather than the order of arrival improves outcomes even where resources are limited. Simple checklists can ensure that life-threatening conditions are recognized and that critical actions are taken. Furthermore, clear designation and organization of resuscitation areas ensure that available resources are within reach when they are needed.¹¹

Critical illness describes a general state which may arise from various medical pathologies (e.g. trauma, infection, stroke etc.) and leads to the impairment of vital (consciousness, circulation or respiration) or single organ functions (e.g. kidney or liver function) and to unstable patients whose condition may rapidly worsen.

Intensive or critical care medicine refers to the medical specialty which focuses on the management of critically ill patients to prevent further aggravation of the disease and disability or death and which prepares the patient for the later continuum of care. This is a cross cutting discipline, which can be applied within the context other medical specialties, including obstetrics, surgery, paediatrics, and internal medicine.

Critical care may be provided in any area of the hospital and is not restricted to A&E, HDU or ICU. Even though it is frequently practiced in dedicated units such as the High Dependency Unit (**HDU**) or Intensive Care Unit (**ICU**), every ward and staff member in the hospital should be equipped, trained and ready to respond to a patient in need of critical care. Hospitals without HDUs or ICUs need identification systems with have the necessary equipment and trained staff to provide simple critical care interventions like for example, care and treatment for women with eclampsia in general maternity wards and status epilepticus due to cerebral malaria in general paediatric wards across Malawi.

Effective continuity of emergency and critical care requires the ability to recognize and quickly respond to critical illness across multiple points of the health system, starting with initial presentation and continuing through the duration of hospitalization. The emergence of the COVID-19 pandemic is a timely example of the need for integrated and functional emergency and critical care systems in all settings. That pandemic's emergence is known to be driven and aggravated by socio-economic, comorbidities, environmental and ecological factors across the world. Even health systems in High Income Countries (HIC) have been limited in their ability to properly and timely respond to significant

¹¹World Health Organization. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured. 2019 http://apps.who.int/gb/ebwha/pdf_files/WHA71/A71_4-en.pdf?ua=1or.

numbers of critically ill patients due to these factors. COVID-19 allows us the opportunity to learn the hard lessons of ad hoc emergency response and to do the vital work to coordinate, integrate and strengthen the health care system across all delivery systems including emergency and critical care.¹²

The World Health Assembly has called on member states to prioritise the establishment of integrated emergency and trauma and acute care systems, to help achieve the health-related Sustainable Development Goals as in Table 1. Indeed, emergency care systems address at least 12 of the targets of the sustainable development goals (SDGs; targets 3.1–3.9, 3d, 11.5 and 16.1) and are particularly relevant to universal health coverage (UHC).¹³

Table 1. Emergency Care and SDG Targets

SDG Goals & Targets	Emergency Intervention
Goal 3.1: Reduce by three quarters, between 2015 and 2030, the maternal mortality ratio	Treatment for obstetric emergencies
Goal 3.2: Reduce by three quarters, between 2015 and 2030, the under-five mortality rate	Treatment for diarrhoea, pneumonia and neonatal conditions
Goal 3.3: Reverse the incidence of malaria and other major diseases and ensure that deaths caused by these diseases are reduced by a half in 2030	Treatment of complicated acute infections and sepsis
Goal 3.4: By 2030, reduce by one-third premature mortality from NCDs	Treatment of exacerbations of NCDs; Strengthen Surgical services
Goal 3.5: Strengthen the treatment of substance abuse	Emergency unit care and harm reduction interventions
Goal 3.6: Halve the burden due to global road traffic crashes by halving the number of fatalities and serious injuries by 2030 compared to 2010	Post-crash emergency care, Strengthen ICUs, Operating Theatres and Diagnostic services
Goal 3.8: Achieve universal health coverage including financial risk protection and access to quality essential healthcare services	Emergency care is an essential component of health care
Goal 11.5: By 2030, significantly reduce the number of deaths and people affected caused by disasters	Disaster preparedness and response for resilient health systems.

UHC is defined by the World Health Organization as all individuals and communities receive the full spectrum of health services, they need without suffering financial hardship. The full spectrum of high-quality care includes health promotion and prevention, essential primary care, secondary specialized care, rehabilitation and palliative care.¹⁴ The government of Malawi is committed to moving towards

¹²Jones KE, Patel NG, Levy MA, et al. Global trends in emerging infectious diseases. Nature 2008; 451: 990–3.

¹³Burkholder TW, Hill K, Hynes EJC. Developing emergency care systems: A human rights-based approach. Bull World Health Organ 2019; 97: 612–9.

¹⁴ World Health Organization. Universal Health Coverage (UHC). [https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-\(uhc\)](https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc))

Universal Health Coverage. Currently, the Health Sector Strategic Plan (HSSP) II defines the Essential Health Package (EHP) while at the same time tackling social determinants of health and aims to:

- 1) Increase equitable access to and improve quality of health care services
- 2) Reduce environmental and social risk factors that have direct impact on health
- 3) Improve the availability and quality of health infrastructure and medical equipment
- 4) Improve availability, retention, performance and motivation of human resources for health for effective, efficient and equitable health service delivery
- 5) Improve the availability, quality and utilization of medicines and medical equipment
- 6) Generate quality information and make it accessible to all intended users for evidence-based decision making through standardized and harmonized tools across all programs
- 7) Increase health sector financial resources and improve efficiency of their allocation and utilization

The development of the content of the most recent EHP was revised and re-worked as it had shown that the former EHPs could not be totally implemented for lack of resources. In this exercise, the potential impact on health outcomes of intervention specific activities and system strengthening was measured. These potential impacts were compared with the health outcomes by extending the package to include additional interventions.¹⁵ While the development of these analytical frameworks helped Malawi to develop a more focused and cost-effective health benefit package, it started through the lens of analysis of the former EHPs and is very program and disease focused without yet addressing the full spectrum of integrated essential services for UHC. With this EHP format, emergency and critical care is therefore not a specific activity but is primarily integrated in the activities that are cost effective that are already included in the EHP. Though emergency and critical care was traditionally perceived as expensive; many emergency treatments and essential critical care interventions are inexpensive and already in the EHP, requiring relatively little training, and can be implemented at first level hospitals and health centres. Timely and quality emergency care interventions can be both efficient and cost effective. Furthermore, integrated emergency care delivery can save lives and maximize impact across the health system while working towards UHC for the population. A lack of investment in frontline emergency care compromises effectiveness limits impact and increases cost in other parts of the health system.

When analysing why the previous EHP could not be fully implemented, irrational prescription of essential drugs, wastage of resources, loss of equipment due to lack of maintenance or theft, duplication of efforts and other factors were not analysed. When defining health benefit packages, a system strengthening approach should be at the centre.

Like in other African countries the disease burden from communicable diseases has decreased in the last years and the disease burden from non-communicable diseases (stroke, ischaemic heart diseases and diabetes) has increased. Both the communicable and non-communicable diseases can present as emergencies hence timely and adequate response will decide about the outcome in the patient.

¹⁵Marie J, Philip K. Supporting the development of an essential health package: principles and initial assessment for Malawi. York, UK, 2016. <http://eprints.whiterose.ac.uk/135772/>.

It is the policy of the Government of Malawi that access to essential health services should be guaranteed to all, in practice resources, equipment and adequate training are limited at all levels of the health care system. In addition, the Malawian health care system in most instances is only partially disability inclusive, which can cause suffering and premature death. In an emergency, there is also a time-limit to avoid further damage or death. Therefore, it is very important to discuss how to make the best use of the limited resources to ensure timely and proper access to essential health services in Malawi, prevent the aggravation of conditions and treat timely and adequately when an emergency happens.

This strategy proposes a holistic approach to integrate emergency and critical care services into the health care system.

1.2 Goal and Objectives

Goal of the strategy:

To save lives and prevent disability through the provision of high quality, equitable essential emergency and critical care services that will help Malawi move towards Universal Health Coverage.

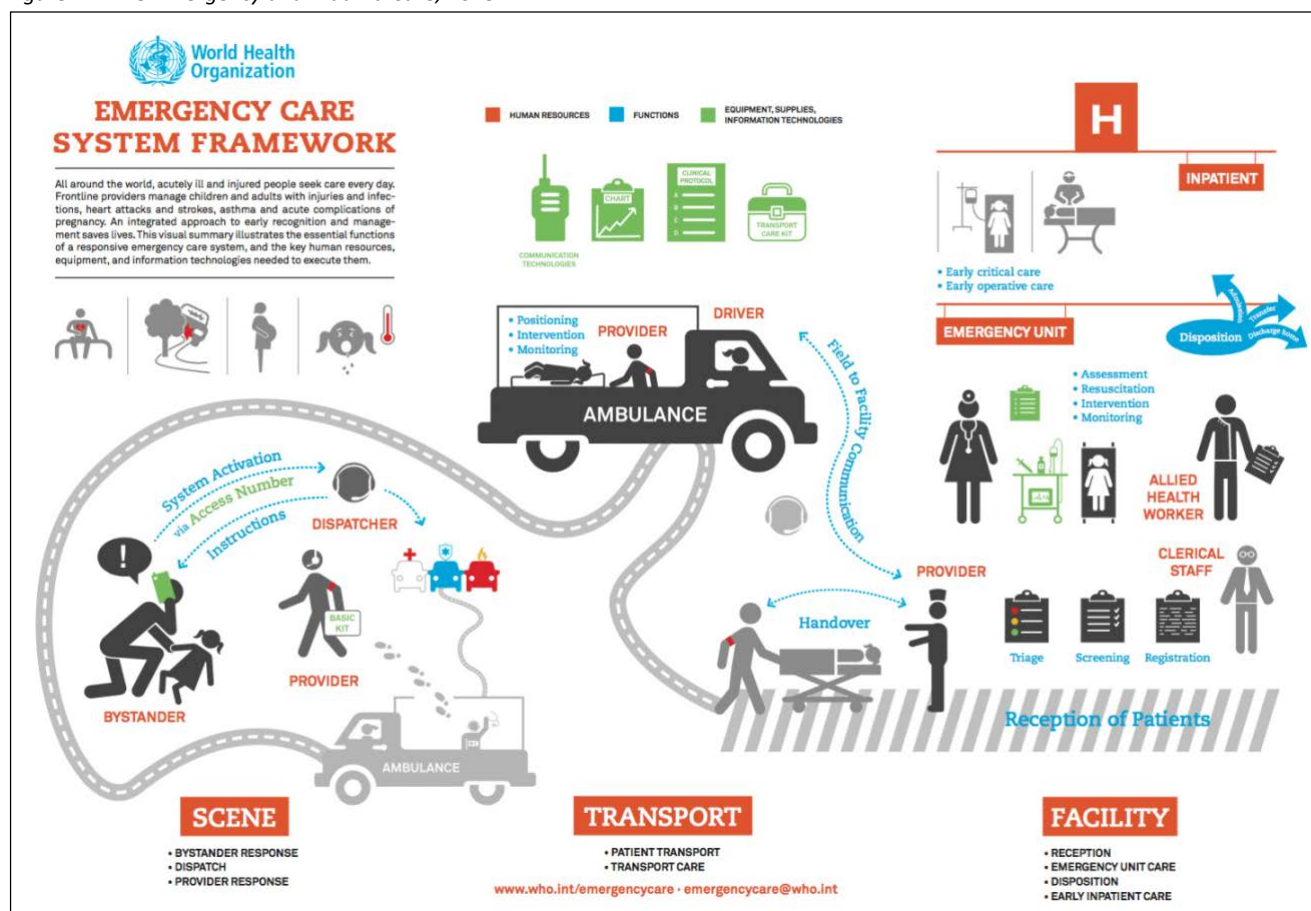
Objectives are to:

1. Create out-of-hospital emergency and critical care services that are responsive to the current and emerging needs of communities including the needs of people with disabilities.
2. Improve the availability and the functioning of universal essential emergency and critical care services.
3. Improve accessibility to high quality targeted critical care services.
4. Improve the availability and the functionality of equipment for diagnostic, treatment and transferring of patients requiring emergency and critical care services at all levels of care.
5. Ensure the availability of essential emergency and critical drugs care and supplies and their rational use
6. Ensure the availability of well-trained and competent staff at all levels for efficient and effective management of patients requiring emergency and critical care services that will include follow up care of patients.
7. Generate high quality data to monitor the provision and coverage of improved emergency and critical care services as well as to build up local knowledge that can be used in efficient patient management, policy formulation and planning of these services.
8. Ensure the availability of well-trained and competent clinical and administrative leaders that are transparent and accountable and sensitive to the needs of people with disabilities, women, men, girls and boys accessing their services.

1.3 Dimensions of Emergency Care

WHO states that Essential and Critical Care must be organised at the scene, during transport and in the health facility. This strategy will work to address the call by the WHO.

Figure 1: WHO Emergency and Trauma Care, 2018



To implement this strategy, it will be critical to create a strong link with the community where some emergencies can be prevented or recognized in an initial state. It is proposed to create a feedback loop to the communities after the hospital care, where continuous care and secondary prevention happens.

The strategy proposes five main areas of focus that will be developed in the following chapters:

- A strengthened inclusive community health system with focus on community and family health and first assistance to emergencies
- A strengthened transport system to community and district hospitals taking into consideration persons with disabilities
- District and community hospitals with the adequate space, human resources and training, equipment drugs and established systems to recognize, stabilize and treat emergencies
- Central hospitals as tertiary level referral, critical care, coaching and reference point
- Improved Governance and leadership

Provision of emergency and critical care services should not be another vertical program inside the essential health care package but should be crosscutting all interventions.

Chapter 2: Situation of Emergency and Critical Care Services in Malawi

Infectious diseases such as diarrhoea, respiratory infections, malaria HIV/AIDS and tuberculosis remain the most common causes of morbidity in Malawi. However, in the last few years the country has seen an increase in non-communicable diseases like ischaemic heart disease, hypertension/stroke, diabetes, cancer and mental illness. There are also increasing numbers of road traffic accidents. All of these conditions can induce an emergency and lead to death.

2.1 Community health, scene, and secondary prevention

Now, when there is an emergency in the communities, people mainly will try to reach the next health facility and many of these health facilities mostly are not easily accessible even less for people with disabilities. In rural communities, those facilities are mostly staffed with a medical assistant, and/or a nurse midwife technician. In cities, some health facilities include doctors or clinical officers, but without a well-defined role in community health.

The staff will try to stabilize the patient and when needed refer. There is no proper longitudinal training or certification process in the recognition of emergencies and how to stabilize a patient, and -except for pregnancy related emergencies- no proper referral procedure. Health Surveillance Assistants (HSAs) are the main actors delivering community health care to populations. If anything, they are only provided with short trainings without hands on experience and knowledge is limited. Currently they do not undergo first aid training or training about the recognition of an emergency. In rural areas, it is also difficult to ensure proper continuous care for people with complicated non-communicable diseases that need comprehensive support by a team of clinicians, nurses, physiotherapist, dieticians etc. and the problem increases when the patient has impairments.

Furthermore, there is need to create multisectoral partnerships and programs with police, road traffic, civil society and community based organizations and leadership to strengthen prevention of acute illness and injury along with a coordinated, efficient response to emergencies and acute patient needs.

2.2 Transport

Up to now, most ambulances in the health sector can be described as “patient carriers “. Most ambulances have been modified to act as mass transportation and utility vehicles and important equipment for transportation of critically ill patients like stretchers, oxygen sources, patient monitors or drug boxes are removed for various reasons. Additionally, the ambulances do not have dedicated personnel to handle patients in transit.

In 2015, the World Bank supported a pilot program for an emergency patient transport system in Malawi called the Emergency Medical Services (EMS). This involved provision of ambulances for emergency patients, training of communities as first responders for accidents, training of existing staff to be paramedics to man the ambulances, introduction of a toll-free number for notification of the EMS in case of an accident, a central command system for coordination of the dispatch of ambulances, and other measures. The pilot was implemented along the M1 road between Blantyre and Lilongwe, which was noted to have a high number of road traffic accidents with significant mortalities. However,

there are challenges with human resource constraints of the trained paramedics also required to attend to duties within the health facility and the limited scope of implementation. There is need to expand provision and communication ability with consideration of additional cadres for staffing and maintenance of the ambulances.

2.3 Emergency care in hospitals

Generally, in nearly all hospitals in the country, emergency services are scattered in several departments with different levels of equipment, drugs and staffing. Almost all District Hospitals and Central Hospitals have an ambulance entry point near the labour ward. In most district hospitals, trauma patients are attended to in casualty department, often only offering examination and minor dressings. In the absence of coordinated emergency services within hospitals, children and other adult patients often queue in the under-five clinics or outpatient departments without proper triage until they are rushed to a ward, where more equipment and drugs can be found. Obstetric emergencies are mainly attended to directly in the labour ward. For gynaecological emergencies, it is sometimes not always clear whether to go to the emergency room, female ward, or labour ward, thereby losing valuable time and causing unnecessary morbidity and mortality.

In Queen Elizabeth Central Hospital, there is one emergency department for children and one for adults, while pregnancy related emergencies are addressed in the labour ward. Both the emergency department and labour ward are often used for OPD patients who are not severely sick, limiting capacity for providing emergency services. In Kamuzu Central Hospital, there are several points of care for severely sick patients: a paediatric emergency room for children, a casualty department for trauma patients where surgical OPD patients are seen, a short stay section for patients suffering from acute mental illness, and a labour ward for obstetric emergencies.

Under project management, triage systems and quality improvement of acute illness have been successfully implemented even at primary levels¹⁶ but most A&E departments and wards are poorly equipped and staffed.¹⁷

2.4 Inpatient critical care

Critical Care services in Malawi are offered in general wards, HDU and ICUS. ICUs and HDUs and even the capacity to recognize and use simple critical care interventions in general wards have not expanded at a desired pace. Now there are only twenty (20) adult ICU beds and six (6) paediatric ICU beds with inadequately equipped HDUs in the countries' government central hospitals. Similarly, very few district hospitals have HDUs that are functional. The few district hospitals that have HDUs have bed capacity not exceeding four. Similarly, there is not the training, equipment, medications and systems in place to provide monitoring and simple critical care responses such as rapid fluid

¹⁶ Gondwe, M.J., Henrion, M.Y.R., O'Byrne, T. *et al.* Clinical diagnosis in paediatric patients at urban primary health care facilities in southern Malawi: a longitudinal observational study. *BMC Health Serv Res* **21**, 150 (2021). <https://doi.org/10.1186/s12913-021-06151-7>

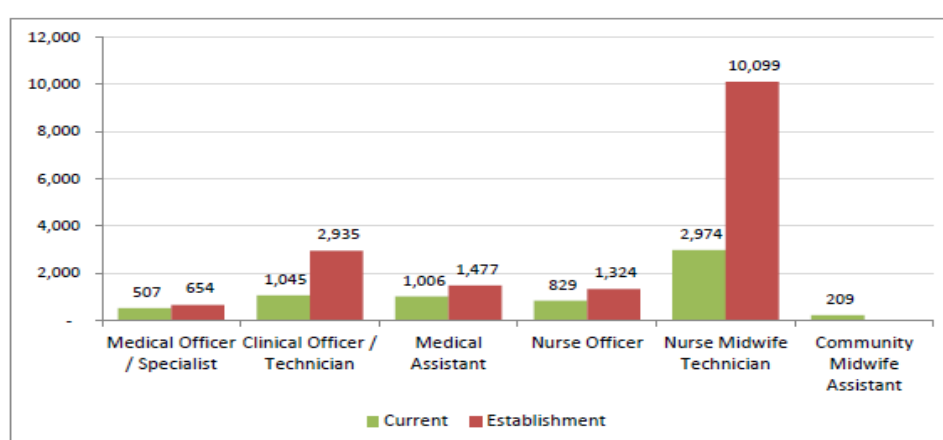
¹⁷ Johansson EW, Lindsjö C, Weiss DJ, et al. Accessibility of basic paediatric emergency care in Malawi: analysis of a national facility census. *BMC Public Health*. 2020;20(1):992. Published 2020 Jun 24. doi:10.1186/s12889-020-09043-3

administration in general wards. This makes critical care services inaccessible to many who need it within the hospital. And while hospitals are equipped with operating theatres, there are no theatres specifically reserved for emergency operations. The reasons for this include limited infrastructure, human resources and equipment.

2.5 Staffing

As seen in Figure 2, Malawi has a critical shortage of health care workers across all cadres.

Figure 2: Number of establishment positions that are filled by sub-cadre (public sector), taken from the Human Resources for Health Strategic Plan 2018-2022



There is currently no career path for nurses to become an emergency and critical care nurse. Most nurses learn emergency and critical care skills on the job.

In district hospitals, there are very few health professionals with adequate knowledge in emergency and critical care services. The clinicians with more experience in critical care are the anaesthetists but they are very few and nearly always on call for theatre. Anaesthetic Clinical Officers are and will remain the backbone of Anaesthesia services in Malawi in the near future. Currently, there are about seven (7) established posts for ACOs per district hospital with only less than half of the positions filled per hospital. The Human Resources for Health Strategic plan has identified a huge number of unfilled positions in critical staff categories delivering emergency and critical care services in Malawi. In response to staff shortages, facilities have resorted to paying staff over time, called “locum” which mostly takes away staff’s resting time particularly affecting nurses in hospitals. This has exacerbated the over-working of the few and critical care staff and anaesthetists in the country.

Additional constraints on staff stem from low salaries, which lead many staff to seek additional income, usually from allowances for attending conferences and workshops.¹⁸ Sometimes more than a quarter of the staff on duty is out for workshops and trainings, which adds to the workforce crisis.

¹⁸ Chimwaza, W., Chipeta, E., Ngwira, A. *et al.* What makes staff consider leaving the health service in Malawi?. *Hum Resour Health* 2014; 12:17.

2.6 Equipment and Maintenance

Although Malawi has a Physical Assets Management (PAM) department charged with the responsibility of maintaining medical equipment, lack of expertise combined with inadequate and unstable funding pose as bottlenecks to the availability of well-maintained and functioning equipment. As funding for maintenance of equipment is not adequate, most health facilities rely on donations of different brands of equipment whose spare parts and consumables are not available in country, rendering the equipment useless even with minor faults.

There is no updated inventory of equipment and state of equipment in health facilities. Similarly, there is no standardised equipment list for emergency and critical care services in hospitals. A list adapted from WHO was used to describe the status of equipment in hospitals (Annex 1). PAM is responsible for conducting inventories and preventive maintenance and repair of equipment. Unfortunately, without a standardization of the equipment and availability of tools and spare parts and schedules for maintenance, equipment is used until it breaks down. No specific training or longitudinal support is available to PAM staff on how to maintain and potentially repair complicated medical equipment.

In terms of equipment, oxygen supply systems and anaesthesia machines are essential elements of emergency and critical care. In Malawi, however, this equipment is oftentimes non-functional and poorly maintained.

Oxygen supply in Malawian hospitals is insufficient and varies from hospital to hospital. The main sources of oxygen are low flow oxygen concentrators though tertiary hospitals have been buying medical oxygen from commercial providers. Recently, oxygen plants have been commissioned in four health facilities (two central and two district hospitals). Plans are underway to commission more oxygen plants with detailed plans for expanding access to oxygen to be explained in the Malawi National Medical Oxygen Ecosystem Scale-Up Roadmap.

The situation of anaesthetic machines in Malawi especially in district hospitals, is very suboptimal as many anaesthetic machines are non-functional, outdated have leaking pipes and are ultimately unsafe for patients. This compromises the delivery of oxygen and anaesthetic gases and leads health workers to resort to the use of spinal anaesthesia or ketamine also for major procedures.

The non-availability of anaesthetic machines and patient monitors limit the range of procedures that can be done and raises unnecessary delays in dealing with life threatening conditions such as eclampsia, bowel obstruction, or trauma, resulting in referrals to larger hospitals and delay in treating the patient sometimes causing death or disability. In addition, frequent power outages inhibit the effectiveness and use of both oxygen supply systems and anaesthesia machines. Power backup for these machines is not always available.

2.7 Medicines and medical supplies

The main provider of essential medicines, laboratory reagents and equipment is the Central Medical Stores Trust, (CMST). Hospitals have their drug budgets ring fenced and that they can primarily procure medicines, supplies and sometimes equipment from the CMST.

Unfortunately, due to financial challenges, CMST is very often stocked out in very critical medicines and supplies making it difficult to effectively manage patients in a rational manner as health professionals are forced to use alternative medications which may not be as effective or request patients to buy the medications from private pharmacies. The shortages have had a negative impact on the availability of essential supplies used in emergency and critical care such as sutures, nasal prongs and other essential supplies.

There is no standard provider of essential equipment for public hospitals other than the Central Medical Stores Trust. Many hospitals get donations and, in some instances, it is even more challenging to get supplies or spare parts.

While in most hospitals drug therapeutic committees are meeting monthly, the major point of discussion is often how to deal with stock-outs and how to ensure presence of essential drugs with limited budgets, there is not much time to discuss on consumption patterns, new treatment protocols or rational prescription of essential medicines.

2.8 Patient documentation and evaluation of care

In Malawi, patient health passports carry the summary of their healthcare records especially for outpatient visits. Access to this record when patients access emergency or critical care hinges on whether the patient brings it. Oftentimes patient health passports, even when present, do not include summaries of past events and medical conditions.

There are mostly no standard admission charts. Very often plain paper is used for admission leaving it to the admitting officer what patient information will be documented. As patient information is not standardized and poorly filled, it is difficult to monitor patients and recognize when they need specific care. And it is also very difficult to get conclusions to evaluate the quality of emergency care because the information is lacking.

Patient documentation is so poor in most hospitals that it is very difficult to evaluate the care offered to a patient. As it stands, it is difficult to quantify and report the number of patients who were admitted with critical care conditions. This makes the planning of emergency and critical care services difficult. There is no standardized admission, treatment and monitoring forms.

As of this writing, only in HIV care are patients' records backed up in an electronic database, and access to the database is program specific. For OPD, some hospitals introduced an electronic system, but it is very slow, not user friendly and the data that can be extracted is in a format that cannot be read by the DHIS2, the National health information system.

Reports are still done manually and then transcribed into the DHIS II. This Health Information System contains 1768 indicators, but there are very few indicators speaking emergency or critical care. Some information can be found in the reports on NCD deaths, on accident deaths or ETAT admissions, but those reports are rarely submitted by facilities. Maternal deaths are the only ones that are

immediately reported. There are no indicators measuring waiting time or linking triage categories to outcome.

2.9 Central and District Leadership and Management of hospitals

In Malawi, health facilities are at operational level led by the Health Management Team (HMT). They are mainly composed of the head of the facility and senior members of other sections such as departmental heads, section heads and sometimes extended to coordinators of vertical programs. Most district hospitals are led only by the district health management team that is also responsible for all health facilities in the district. The head of the DHMT serves as a member of the District Council.

Most members on district health management teams lack leadership and management experience. Recently with the creation of the quality department in the MoH, quality improvement has become a focus in the health system. While work improvement teams and quality improvement and support teams have been officially installed, improvements are very slow, especially because the focal points are often away from clinical practice and quality improvement is often just seen as another task put on the back of the clinicians and nurses. Also, often the propositions coming out to improve quality cannot be implemented because of lack of financial and personnel commitment.

Regarding audits, currently, only clinical death audits are being-conducted in maternal, neonatal, and child health clinical services, though this has not been fully adopted by some hospitals- since they have been led by vertical programmes. The results have not been fully utilised at all levels to influence changes in policy and practice. File audits are very rarely done.

Recently, the office of the Hospital Ombudsman has been introduced to respond to patients' and guardians' complaints and mediate in conflicts with staff. While this is a good development, the ombudsmen are often regarded as spies by the staff and their valuable contributions not always welcomed by the management teams. Finally, they themselves are often members of the management and thus have conflict of interest. While all district and central hospitals are learning spaces for junior nurses and clinicians, the staff shortage and the lack of good teachers often leave the learners alone with tasks that they should not yet do without supervision.

2.10 Financing Health Services in Malawi

The current financial allocation is based on the burden of diseases but there is allocative and technical inefficiency since there is mismatch between relative disease burden and the corresponding proportions of total expenditure, as donors contribute to specific packages. Strengthening emergency systems as opposed to only disease programs has the potential to rationalize the use of resources because emergencies for conditions such as malaria, hypertension, maternity or a road traffic accident will utilise the same staff skills and basic equipment at least for stabilization. This could lead to potential economic gains.

Funding allocation by specific diseases has resulted in a weak emergency and critical care system, exposed by the COVID-19 pandemic in Malawi and elsewhere. As the COVID-19 pandemic is a protracted pandemic that spreads through and exacerbates socioeconomic inequalities and stresses

health systems, an emergency and critical care system must be comprehensive, resilient, equity focused, and able to take care of the critically sick patients while ensuring that their careers and families are safe. This disease needs a participatory public health approach, which uses diverse sources of knowledge, disciplines and capabilities and includes the population, not a disease focused approach to reduce DALYS. As part of the response plan for COVID-19, it will be of great importance if a good proportion of response funding goes to the strengthening of emergency and critical care systems. This public health approach beyond diseases and DALYS if effectively and efficiently implemented can further meet the 21st century challenges of pandemics, climate, food and energy crises, growing social inequality, conflict and other threats to human health.

Chapter 3: Strategic Intervention Areas

Emergency and critical care services are key components in the delivery of the Universal Health Coverage. As described in chapter 2, these services are not well developed and not well organised in Malawi. This strategy provides clear guidance to the policy makers, implementers as well as funders or partners to support and implement well-organised and timely emergency and critical care services in the country.

This chapter proposes integrated emergency and critical care services in District/Community hospitals and Central Hospitals that are well equipped for adults, children, pregnant women and trauma. The integrated emergency and critical care departments will ensure that equipment, drugs as well as personnel are shared.

3.1 Intra-hospital Care

Intra-hospital care follows the patient through as the patient enters the emergency services, the admission and treatment in the hospital and until the patient is sent back to the community. The out-of-hospital-care, the required human resources, equipment and drugs are dealt with in specific chapters. The proposed integrated emergency and critical care services will be based on four basic principles namely:

- Interdisciplinary teamwork
- Well-trained staff able to respond to different types of emergencies
- Respect for patient rights
- Effective communication

Emergency care services should be easily accessible at the entrance of the facility and emergency care must be accessible for people with disabilities together with all critical care services. In hospitals where patients must pay for services, emergency care must be delivered without delay for payment.

3.1.1 Facility Emergency Care Services

In this section, the proposed settings for re-organisation of emergency care services according to patient pathways will be described. Understanding the patient pathway for patients with emergencies is critical when designing emergency and critical care services. Patients can walk from home, come from family care, be picked up by an ambulance, be referred from a health centre or arrive via the outpatient department of the facility. After stabilization and treatment in the emergency department, they can go back to the community after a short stay, be admitted to the wards via the admission room, go to the theatre, to the HDU/ICU, be referred to another facility or unfortunately die and go to the mortuary.

Emergencies and critically ill patients can originate from any speciality such as Obstetrics, Gynaecology, Paediatrics, Neonatology, infectious diseases, NCD, mental health, intoxication, GBV, -injuries and trauma, surgical emergencies. All these emergencies can be saved if the signal functions of emergency care such as managing the airway and breathing, managing shock, managing the severe

mental status, managing pain and trauma, managing obstetric and gynaecological emergencies are well and timely organised.

This strategy proposes an integrated approach to managing emergencies at all levels of the health delivery system. The system if achieved will allow the pooling of the critical and scarce resources required for managing patients requiring emergency and critical care such as human resources, equipment and drugs.

3.1.2 Emergency Departments

The emergency department is a place where patients with undifferentiated life threatening or potentially life-threatening illness and/or injury are attended to with the aim of reducing impairment and/or preventing mortality. For effective and efficient achievement of this, the design needs to accommodate patient, family and staff needs for a service that dignifies each of these groups. The size of the ED will vary among hospitals based on the burden of emergency care for each hospital and the size of the land available for each hospital. Some hospitals, especially at the district level will require rehabilitation by combining existing spaces and/or structures.

3.1.2.1 Common tenets in improving emergency care services

The following tenets should be considered when designing any emergency care department:

Care and Patient Considerations

- Triage of patients is at the core of successful patient care and should be mandatory at each facility and all staff must be trained in triage and patient resuscitation
- Patient pathways must be organized in a way that entrance for critical patients is straight and easily visible without obstacles and queuing
- At the entrance for cars, stretchers and wheelchairs are available, a patient will be moved on a determined stretcher if possible and all interventions done on it until the destination of definitive care.
- The design of emergency rooms should ensure that infectious patients are kept away from others.
- Both the short stay ward with cubicles for men, women, children and one for infectious diseases and the admission room should be close to the entrance.
- A family room outside serves for talking to the families, or for grieving and can be used as counselling room

Infrastructure Considerations

- Direct staff involvement at every level
- Power backup station outside
- Water tank for the whole department
- Oxygen back up, for instance medium concentrator that makes 200 litres O₂/min etc.

3.1.2.2 Infrastructure and Organization Considerations for Patient Care

The emergency department should have a separate entrance with access for patients who are brought

on foot, on private vehicles, on ambulances or by a helicopter. From the entrance, the district and central hospital infrastructure patient flow differs. The length of stay in an emergency unit should be enough time to complete the initial diagnosis and treatment and to assess the need for hospitalization versus management at home, ideally with a length of stay under 6-12 hours.

District Hospital level facilities

The department itself needs to have a reception, triage area, resuscitation room (for critically ill patients), cubicles for patients with serious illness and procedure rooms. The resuscitation room should be one large room with bed allocation based on the hospital's statistics for various patient categories. Categories to be considered are those that require specialized equipment for their stabilization. The bed allocation should therefore be accompanied by appropriate equipment for the patient group. These categories should include paediatric, trauma, obstetric and general. The cubicles for the seriously ill patients should not be categorized as the patients do not come with a diagnosis. Special procedures should be done in procedure rooms. There should be one procedure room designated for uterine evacuation and a larger procedure room that can accommodate more than one patient with mobile partitions for other procedures. Patients with clear-cut obstetric emergencies should go to the labour ward. The labour ward design should include an admissions section similar to what is described as an obstetric emergency unit at the central hospital. This admissions section should be designed to allow for appropriate triage, resuscitation, patient assessment and stabilization before they go to appropriate wards. Only the ones assessed to be in labour should go to the delivery rooms.

Central Hospital

The central hospital emergency department is expected to receive patients with critical illness that requires specialised and super-specialised care. Even though the processes of emergency care remain the same, there will be significant modifications in these processes for different patient groups that requires that these patient groups should be seen in separate parts of the same emergency department block. The block should have the capability to care for traumatic injury, children, obstetric emergency and all other patients with infectious or non-infectious critical illness. Each of these four sections within the emergency department should have a reception, triage area, resuscitation room (one large room for critically ill patients), cubicles for patients and procedure rooms for special procedures. The sections have bed allocation based on expected numbers for catchment area. The bed allocation should be accompanied by designation of appropriate specialised equipment for the patient group such as a designated delivery bed for the obstetrics section. In the general adult section, there should be one procedure room designated for uterine evacuation and a larger procedure room that can accommodate more than one patient with mobile partitions for other procedures.

Diagnostic Services

Diagnostic services need to be arranged in a way that minimizes patient movement between the department and other parts of the hospital. The department should therefore have a mini or satellite laboratory for point of care testing that includes a blood bank. There should also be a minimum or a mobile X-ray machine and a portable ultrasound machine for point of care radiological testing in the resuscitation room. The radiology department should be in close proximity for patients being seen in the cubicles especially at a central hospital level for specialized testing such as CT scan.

Pharmacy/Dispensary

A dispensary should be located within the emergency department and be run by competent pharmacy personnel to ensure appropriate medication inventories are maintained.

Family and Visitor Considerations

In the emergency department there should be a waiting room, which will have amenities such as a tuck-shop, TV screen and toilet facilities adjacent. At a district level, there should be one spacious room for the whole emergency department for counselling and grieving which will cater for all patients and family in the department who need it. At a central level, there should be several counselling and grieving rooms to allow for increased patient volume.

Staff Considerations

The personnel working in the emergency department need facilities that promote safety, dignity, career development and general wellbeing for them to effectively provide emergency care services. The staff need changing rooms, bathrooms, and showers segregated for male and female personnel adjusted for the number of staff. This area should include staff lockers to allow them to store their work clothes and personal belongings safely. There should be sleeping rooms near the changing rooms with a room for dining, tea and refreshments. The department will need a seminar room for conducting handovers, meetings and teaching sessions along with a resource room with adequate computers, internet and other learning resources for personnel's career and professional development. There should be administrative space for the leadership of the department. In the central hospital, the proposed leadership structure is that of divisional head who oversees all the four sections ensuring the general emergency care principles are adhered to and team work is promoted. The teams are expected to work together particularly for major incidents or disasters. The paediatric unit should be headed by a paediatric EM specialist, the trauma unit by a trauma surgeon and or EM specialist, the general EM unit by an EM specialist, the Obstetric unit by an obstetrician. The specialist nursing counterparts also need to be mirrored in all the four units.

3.1.2.3 Short Stay Unit

These units are physically separated from the Emergency Department (ED) and designated for short term treatment and reassessment of patients initially treated in the emergency department. They have specific admission and discharge criteria and policies and patients should have enough time to complete the initial diagnosis and treatment and to assess the need for hospitalization versus management at home. Patients who need more than 24 hours of hospitalisation should be admitted to the wards.

There should be continuous communication between the ED, ward and short stay. The short stay unit in central hospitals should have a minimum 20 beds and 10 beds for a district hospital level facility.

Purpose of ED short stay units:

- Reduce inappropriate admissions to inpatient beds and associated healthcare costs

- Improve patient flow by providing timely assessments and treatment, allowing patient discharge in the shortest, clinically appropriate time.

Short stay units are required to:

- Have a dedicated nursing station that is centrally located and adequate desk space
- Have staff changing rooms, toilets and baths, lounge, rest-rooms (with shower and toilet)
- Patient's toilets and shower facilities
- Have access to a kitchen area
- Have storage facilities as well as sluices separating clean and dirty material and instruments
- Have a full staff complement for 24 hours
- Doctor's office
- Waiting area

3.1.2.4 Inpatient and Critical Care Services

Inpatient care offers an opportunity for doctors, nurses and other staff to provide definitive, continuous as well as critical care services for patients. It also offers an opportunity to prevent patients from disability and offers rehabilitative services. The definitive and continuous care may include medication under observations, specialists care such as surgery, paediatrics, obstetrics etc. Specialist care for patients is increasing as the number of specialists in all areas increase. It is critical that Malawi continues developing specialist and sub-specialist care in each department such as paediatric surgery and other areas.

To succeed caring for the sicker patients, all the wards in the hospital must be properly organized and managed so that patients receive the care needed. The wards are a place where patients can deteriorate to require critical care and all staff and wards should be prepared and equipped to respond urgently with recognition and treatment. Facilities should have clear protocols for patient monitoring and re-assessment, including the use of early warning scores to help detect critical illness of a patient immediately. Care providers need to be well trained so that they do not miss the patients who require simple critical care interventions with close monitoring with possible HDU/ICU transfer. The patient flow is very critical in in-patient wards and it is important that the wards have an area where more sick patients are cared for. Each ward will be arranged to improve patient monitoring with areas for critically ill patients and those recovering. Infectious patients and patients with special needs should be cared for in special designated areas.

3.1.2.4.1 Infrastructure and organisation of wards for patient care

Every ward should have a section to accommodate critically ill patients discharged from the HDU or ICU or those critically ill but cannot access ICU or HDU services for close monitoring and improved nursing ratios. This area can also be used for sick patients not needing HDU care and it should be close to the nurses' station. It should have a minimum of 8 adjustable beds. The following standards should be followed:

- Every ward should have access to medical oxygen that can easily be accessed by patients.

- Every ward needs access to power back up and maintain water and sanitation systems.
- There should be a computer outlet where X rays and laboratory information for every patient can be accessed and eventually printed out.
- Patients who are getting better should be moved to the general patient area.
- Wards should have reception/ waiting area, staff changing rooms, toilets and baths, kitchen, rest rooms, toilets and shower facilities for patients, access to a kitchen area, storage facilities as well as sluices separating clean and dirty material and instruments, a full staff complement for 24hours, doctors rest room /office and counselling room.

Every admitted patient needs a patient file that includes an admission file, monitoring sheets, medication sheets, result sheets, specific consent forms and nursing and clinician notes. Within the ward, there should be a patient file policy organizing how patient information should be organized and stored. It is important that each ward has patient treatment and monitoring protocols displayed and those should be followed by all staff treating and monitoring patients. For patients who are seen in specialized clinics, such as HIV and NCDs, the clinic staff or specialists should coordinate closely with the ward team with in person visits as agreed upon with staff per patient care and severity.

For staffing for high quality patient care, requires an up-to-date roster of staff caring for patients such as emergency care staff on call, and specialist consultation on call; also, numbers for physiotherapy, dietician and counsellors must be displayed. Scheduled hand overs between shifts should be attended by the ward clinicians, in case of need, specialists are called for advice and participate in hand over. Hand overs between nurses on shifts must be written and signed. Weekly ward meetings and file audits should be conducted for team building and quality improvement purposes and minutes should be taken.

3.1.2.4.2 Infrastructure and organisation of theatres

An operating theatre should have a standard design and equipment and safety standards like elsewhere in the world. During the implementation of this strategy, the Ministry shall work to update theatre infrastructure designs to the required standards. This will involve renovating seriously deficient facilities and constructing new sections of facilities where needed, adding fixtures and furniture to meet standards and building ensuring adequate water, power, and other utilities. The design of standard operating theatre should now include the following:

- A theatre complex should have a patient receiving area with patient monitoring equipment and oxygen supply. There should be a receiving bed for every operating room. This will act as the designated entrance for patients into the theatre complex.
- An operating theatre should be a minimum of 7m X 7m; should have a scrubbing and gowning area with/out foot pedals; sluice, instrument cleaning area. There should be a separate entrance for patients and staff. The operating rooms should have good lighting, ventilation, heating and cooling system. They should be closed to the outside environment. Every theatre should have an effective scavenging system and pressure control system.
- A theatre complex should have a laundry, CSSD, sterile room for keeping sterile equipment, storage rooms (aesthetic, surgical, nursing)
- The Central Hospital theatre complex should have enough operating rooms.

- Changing room (male and female) with showers and toilets
- Office space (theatre manager, anaesthetist, nurses, surgeons)
- Lounge
- Rest room (anaesthetist, nurse)
- Post Anaesthetic Care Unit (Recovery) with patient monitoring equipment and staff.
- A communication system
- A mini-lab for point of care tests

3.1.2.4.3 Infrastructure and organisation of HDUs and ICUs

Ideally, critical care service areas such as HDU and ICUs must be with a clear criterion on how to admit and discharge patients from the area. It should be easily accessible from all other clinical care areas such as AETC, wards, theatres, lab, radiology and others. During the implementation of this strategy, each district level hospital will be required to develop a 12-bed multidisciplinary HDU. In the central hospitals, every division/department should have an area designated for an HDU. The minimum number of beds should be 10 per division/department. Neonatal care units which will act as HDUs for sick new-borns should be maintained close to the labour ward.

During the implementation of this strategy, ICUs in central hospitals should be multidisciplinary and have a minimum of 10 beds. There should be 2 Isolation rooms and 2 VIP rooms that are visible from the nurses' station. ICUs and HDUs should have all rooms accessible to all people including those with disabilities; a reception/waiting area, adequate bed spacing, counselling room, staff lounge, staff changing room and conference room, offices (doctors, nursing), doctors rest room. It should have 2 entries; one for patients and the other for staff. All rooms in ICUs should be fitted with alarm bells, an intercommunication system for staff and call system for patients.

They should ideally have a centralised patient monitoring system, not less than 10 power outlets per bed (round pin and square pin) and cooling and heating facilities. Critical care areas should have a reliable piped oxygen supply, wall suction/vacuum and piped air and back up, reliable power supply with back up and a water supply reserve. With Antimicrobial resistance (AMR) and the emergence infectious diseases like COVID 19, isolation wards within HDUs should also be available which might be separate or cubicles within the HDU.

A clinical laboratory should be available on a 24-hr basis to provide basic haematological, chemistry (for HDUs and ICUs), blood gas (ICUs), and possibly toxicology analysis (ICUs). Laboratory tests must be obtained in a timely manner as dictated by the condition.

In ICUs, portable Radiologic and imaging equipment and services must always be available for diagnostic and invasive procedures. For HDUs Point of Care ultrasound should be available.

HDUs and ICU must have reception/ waiting area, staff changing rooms, toilets and baths, kitchen, rest rooms, own toilets and shower facilities for patients, access to a kitchen area, storage facilities as well as sluices separating clean and dirty material and instruments, a full staff complement for 24 hours, doctors rest room /offices, a counselling room and a conference room.

Both ICUs and HDUs should have specialised beds that should be capable of being elevated to a 30 degrees angle as a minimum.

3.1.3 Emergency and Critical Care Infection Prevention and Control

Infection prevention and control is an important aspect in emergency and critical care services. This includes:

- Basic day to day infection prevention practices
- Prevention of transmission of known infectious diseases
- Recognition and prevention of transmission of suspected infections

This requires deliberate infrastructure, policy, practice, and monitoring. It will be important for establish designated regional emergency hospitals that will promote research as well as develop capacity for any emerging infectious disease. The infrastructure should be conducive for traffic control through the emergency and critical care areas. The design should allow patients and staff working in these areas to access them including those with disabilities. There should be as much as possible be a provision for one-way traffic for patients and family.

The infrastructure should have facilities for appropriate hand washing and drying for both patients and staff in the patient care areas, staff rest areas, family and patient waiting areas. This means multiple points with running water and disposable towels or reusable towels that are washed after single use. There is need for enough toilets and bathrooms that are disability friendly and allows wheelchair manoeuvring for patients, families, and staff members. This requires appropriate water backup infrastructure to ensure continuous supply.

In emergency departments, every cubicle should have a hand washing facility with taps that are hands free, a sterilization area, laundry for cleaning and disinfecting equipment. An isolation room should be situated outside the emergency room not very far from ambulance offloading bay/reception. The location should ensure minimum traffic to the room to prevent further spread of infectious diseases. There should also be a decontamination zone for patients coming in from a contaminated scene. Flow of patients, family, staff should be strictly controlled to avoid spread of infection and connotation of surfaces. The design of the department should therefore ensure one-way traffic of patients, family and staff. The emergency department entrance should strictly be for patients and personnel with business in the department.

For waste in the emergency department, specific pathway for dirty linen, instruments, dry and wet waste and sharps. There will be an opening from every cubicle to a specific outside area where hospital attendants will collect linen and instruments to bring them to decontamination and sterilizing areas- and where waste will be collected and treated as indicated. There should be infrastructure and supplies for appropriate waste separation. For instance, colour coded hanging waste baskets beside every bed. There is also need for efficient sterilization facilities for equipment, procedure sets and associated drapes. Therefore, there should be a specific sterilizer for the emergency department and in Central hospitals also for the ICU.

3.1.4 Prevention of transmission of known and suspected highly infectious diseases

Standard Operating Procedures (SOP) for identification and isolation of patients with suspected infectious diseases like Tuberculosis, COVID 19, Cholera etc. from triage to admission should be available. Additionally, there must be procedures on collection, handling and processing of clinical data and specimen, and feedback while stabilizing the patient in isolation. This requires being on high alert for unusual patient presentations as well as emerging diseases and their potential means of transmission.

Appropriate waiting/treatment area for isolating these patients while they are being stabilized in the emergency unit and all critical care units should be available. The quality of care in the isolation areas must be the same as in the main emergency /critical care department. Cleaning and decontamination of work spaces, equipment should be done regularly and have clearly documented policies and standard operating procedures on how to correctly do this.

3.2 Out of hospital care- community health, family medicine and transport

Out-of-hospital care is the first attention to a patient with an emergency and his safe transport to a facility where he can be taken care of, previously called pre-hospital care and the follow-up of the patient when coming back from the hospital. In this strategy **after-hospital care or secondary prevention**, has been added to the WHO emergency care framework to cater for patients coming back to the community and those put on long-term treatment or life style plan in the continuum of care. This section will describe the role of the community, the trained first responders and the professional responders in first attendance and continuous care as well as the patient transfers.

3.2.1 The role of the community in emergency and critical care

The community has three broad contributions to high quality emergency and critical care services namely prevention, response and advocacy. The community needs civic education targeted at awareness of what emergency and/or critical illness is and what role they can play to prevent it. Messages should be tailored to the needs and the capacity to understand all groups of the society, including children, youth, the elderly and people with disabilities.

Emergency or critical illness can arise as a new condition. For instance, injuries, poisoning, new infections like malaria and environmental exposures. It can also arise from poorly managed pre-existing conditions as HIV related opportunistic infections, coronary heart disease from chronic non-communicable diseases, complications for epilepsy or cancer and many more. Emergencies can also be the result of social problems and addictions. Prevention at the community level is therefore primary, when it is prevention of the occurrence of the critical illnesses that arise in the absence of pre-existing conditions or secondary where the aim is preventing complications from chronic illnesses.

Primary prevention will require community awareness on risks of injuries and accidents, acute infections, chronic conditions and screening for communicable diseases that can cause emergencies and critical illness when left untreated.

Secondary prevention will require the **presence of professional primary health care providers** in the community and primary health care facilities to ensure appropriate management of illness before it turns into an emergency or critical illness and to make sure people adhere to treatment plans and life style changes.

To achieve this, a concept of **family medicine** will be implemented at the primary health facility and in the community that will see HSAs, community nurses, midwives and clinicians work together promoting and treating patients in the communities with home visits as a main task. The presence of specialised family physicians in the community will ensure that the out of hospital services are well organised and improved.

3.2.2 Emergency Response in communities

Once the community is aware of emergency and critical illness and how to recognize it, there is need to ensure they have the knowledge and resources for an appropriate response. The response may be as simple as arranging for professional help or provision of first aid or advocacy at a village, catchment, or district level. The community needs to form structures that demand accountability and transparency and patient sensitive provision of emergency and critical care services. They need to know the key players in the chain of survival and who to hold accountable when part of the chain is lax. This will be key in ensuring universal access to emergency and critical care.

During the implementation of this strategy, the Village Health Committees and volunteers will be equipped to recognise emergencies and ensure efficient transport to the nearest health facility. All **volunteers** will be trained in **first aid** with requirements for certification and continuing education, mentorship and recertification. This will help patients with emergency or critical illness to get to the facility or wait for professional response safely. The family health teams will ensure constant contacts with communities, and they will organize mentorship and recertification in their community sensitization programs. Some suggested deliberate efforts to increase uptake of first aid certification and action will include:

- Incorporating it into the pre-school, primary school and secondary school education
- Making it mandatory for those applying for or renewing a driver's license. This can be implemented in a phased approach starting with those driving passenger carrying vehicles such as buses.
- Making it mandatory for every car to have a well-equipped first aid box
- Making it mandatory for those applying for a job in the public service, military, police
- Making it mandatory for those applying for a place at the university
- Making it mandatory for all community leaders and leaders of community-based organisations

The first aid certification needs to be standardized and regulated to ensure maintenance of high-quality standards and inclusion of the most relevant skills acquisition. Renewal of skills also needs regulation and standardization. The Ministry of Health will create standards of the equipment and availability of medication for each level of out-of-hospital care.

The health centre shall be the centre of organizing the response with the possibility of a first stabilization of a patient, in cooperation with the call centres and the organized community volunteers. The call centres will be responsible to send staffed and equipped ambulances and to inform the referral hospitals about the arrival of patients.

The community needs to form structures that demand accountability and transparency and patient sensitive provision of emergency and critical care services. They need to know the key players in the chain of survival and who to hold accountable when part of the chain is lax. This will be key in ensuring universal access to emergency and critical care.

3.2.3 Communication and patient transfer system

There is need for a toll-free number. There is currently the number 118, being used for the EMS (Emergency Medical Services) project restricted to responding to road traffic accidents along the M1 road and it will need to be expanded nationwide for all kind of emergencies. Guidelines and protocols for transferring patients will be developed and used at all levels. To improve patient survival, the ambulances will be equipped with adequate oxygen facilities.

There is need for call/dispatch centre with a backup system. The centre should have capacity to take calls, triage them and send the closest most appropriate responder. The dispatch centre should be in contact with callers, trained first responders, professional responders as well as the receiving health facilities. The dispatch centre requires personnel specifically trained in out-of-hospital care with capacity for medical remote assistance in difficult decisions. All ambulances should ideally be linked to the dispatch centre via GPS system. The following specifications are required for ambulances to provide appropriate in transit emergency care:

- Adequate space and can survive bad terrain, higher vehicles with 4x4 possibility
- Power supply for equipment (monitors etc.)
- Secure location for large re-fillable oxygen cylinder
- Rails for securing equipment during patient transport and a fixed drip stands
- Hand washing and waste disposal facilities
- Patient stretcher that is foldable, with ability to adjust the top half
- Ambulance chair for patients who can only be transported in the sitting position
- Immobilisation equipment for injured patients
- Extrication equipment for entrapped patients (On the road or in buildings)
- Appropriate medication, supplies, equipment for the level of training of the professional providers using the patient transport

3.3 Staffing and certification training for health workers for emergency and critical care services

This section will describe the staffing needs for each area offering emergency and critical care services in the patient pathway. For successful and efficient emergency and critical care, services require multidisciplinary teams of doctors, nurses/midwives, pharmacists, laboratory technicians, dieticians, and other support cadres of the health system. The strategy proposes increasing of the most

understaffed cadres, create additional specialists' positions and revision of nurse/midwife patient ratios. In addition to the certification, mentorship and supportive supervision will be key. The strategy will support the central level and the central hospitals teams to be designated to work with hospitals and staff on quality improvement and developing clinical coaching roles at a district health management level.

Effective communication, team working, and good leadership will be required if the facilities are to achieve the goals of this strategy. Any health worker working in emergency and critical care services will be required to develop the following eight Cs:

Figure 3: Eight C's of Emergency and Critical Care

- Competence
- Compassion
- Communication (with patient and family)
- Consideration (to patients, relatives and colleagues) and avoidance of conflict
- Comfort: prevention of suffering
- Carefulness (avoidance of injury)
- Consistency
- Closure

3.3.1 Staff requirements for Emergency department

In Central Hospitals, the team should be led by an Emergency Medicine (EM) specialist or an experienced clinician and in district hospitals the team will be led in the beginning by an experienced clinician preferably with bachelor in anaesthesia or internal medicine that have undergone an emergency care training program, later there will be specialists in EM. If the facility has a smaller caseload, the same person can also oversee the short stay. In the central hospitals, several clinicians and registrars of all specialities should cover the cubicles while in district hospitals, depending on the case load one or more clinicians can cover the department with an option of calling others when need arises. Since Malawi has no specialised nurses in emergency and critical care, a senior registered nurse should lead the nursing team in the beginning. Later the lead should be a specialized nurse. All nurses working in emergency departments should be trained minimum a short course in emergency care (for instance the WHO Basic Emergency Care course) and should be enough to attend to all cubicles. There should be specific nurses for paediatric emergencies and midwives for the obstetric and gynaecological cases. Patient attendants, IT personnel, clerks and laboratory attendants and porters should be trained in triage. All clinicians in the department should be trained in the use of Point of Care (PoC) ultrasound and other POC devices. To cater for patients with different categories of disabilities there should be sign language interpreters and other disability assistants in each hospital to assist when needs arises and health workers will be trained on how to communicate and care for persons with disabilities. Please see Annex 2 for a staffing summary table.

3.3.2 Staff requirements for short stay and admission

An EM consultant and the senior registered – later a specialized - nurse should be the leaders of the short stay in the central hospitals, and in district hospitals a clinician with at least a bachelor in anaesthesia or internal medicine should lead the team. Medical and nursing staff should be sufficient

to meet the objectives of the short stay of providing quality, inclusive and timely care. Ward rounds should be conducted at least twice daily by a consultant or senior clinical. When junior clinical staff are rostered, the roster profile will be structured to allow direct supervision on a case-by-case basis, for every patient by a more senior officer (Registrar level).

3.3.3 Staff requirements for Critical Care Services

The HDU will be led by a Critical care nurse and will strive to have 1 nurse for 4 patients. A consultant in the respective department, will provide clinical leadership for the Unit. At the district Hospital, senior nurses and senior clinicians should lead the units in the beginning, later to be replaced by specialized nurses and clinicians. All HDU staff in district hospitals will be connected to consultants in Central Hospitals or abroad through a managed clinical network as well as through telemedicine.

The ICU will be led by a Critical care nurse and will strive to have 1 nurse for 2 patients. In the ICU, a consultant anaesthesiologist/intensivist will provide, leadership & governance, clinical services including bedside supervision, training and mentorship, research guidance and quality control. The consultant Anaesthesiologist/Intensivist will lead the clinical part of the multidisciplinary team including clinicians, nurses, physiotherapists, dieticians etc. A senior critical care nurse will provide nursing leadership for the unit.

An orientation will be conducted for all staff before assuming responsibility for patient care in the ICU and HDU that includes physiotherapists/ occupation therapists, nutritionists, radiologists/technicians, laboratory technicians, respiratory therapists, social workers, Pharmacologists/technicians, biomedical engineers, clerks, porters, attendants, and sign language interpreters will be critical in treating patients in ICU.

3.3.4 Staff requirements for wards

it is critical that each ward has a dedicated team of clinicians, nurses, and other support staff to ensure that patients receive the best care. In the implementation of this strategy, each specialty will be required to develop or update its clinical standards to ensure that quality evidence-based care is provided.

At the central hospital, each ward will be led by a senior consultant and an experienced medical officer while at the district hospital, a medical/ clinical (preferably the one with BSc) officer will lead the ward. An experienced nursing officer will oversee the nursing care. The clinician and the nursing officer in charge will be expected to work hand in hand in the organization of patient care.

This leadership team will be responsible in ensuring career development for its staff i.e., create subspecialties, certification and continuing mentorship and training. They will also be responsible in creating a clinical network with the district/CHAM hospitals to ensure quality care at these secondary level health facilities.

Ward rounds will be done by the clinicians together with nursing officers to jointly plan and execute treatment in a timely manner. A clinician should readily be available during the day to attend to any needs of the patients as reported by the nursing officers, the clinician will be expected to provide handover of all critical patients in the ward to the team coming on call.

Clinical nutrition shall be a major issue in this strategy especially with the increase of lifestyle diseases. The hospitals should have adequate number of dieticians to advise health workers as well as patients on the nutrient requirements for each patient. Physiotherapist and counsellors are part of the teams in the same time as patient attendant.

Figure 4: Principles of effective management of wards

- Training and mentorship of specialty nurses and clinicians to lead wards and no rotation of nurses
- Daily wards round in every ward is obligated
- Ward rounds are done within a team of nurses and clinicians
- Once weekly there must be a grand ward round with seniors
- Every morning after the ward round, patients that are sicker and might benefit

3.3.5 Staffing requirements for theatres

The theatre is an important component of emergency and critical care. Having competence to perform different surgical interventions in a safe environment is important for improved patient outcome. Infection prevention measures must be adhered to all the time. It is important that all health workers working in theatre should have the appropriate skills. Theatre nurses should have special skills in Theatre & Emergency Nursing, Basic & Advanced Life Support, be oriented in theatre procedures and led by a competent nurse leader. There should be adequate nurses per shift per theatre (Scrub/ Assist, circulate, coordinate and Recover).

All **clinicians conducting surgery** should have appropriate skills and all unexperienced clinicians should be supervised. To ensure patient safety the district hospitals should arrange specialist visits to their facilities for clinical support. They should also arrange visits/rotations for the districts clinicians to the central hospital to help them boost their surgical and theatre skills. During the implementation, district hospitals should have at least a Surgeon and Gynaecologist or BSC Clinical Officers specialised in surgery and obstetrics and gynaecology. All health workers performing surgery in the lower hospitals will be supported through a managed clinical network.

All **anaesthetists** in the theatres should be well trained. In Central Hospitals, the anaesthetic department should be led by an anaesthesiologist while at the district hospital, an experienced anaesthetic clinical officer will lead the department. As Malawi faces critical shortage of these cadres, during the implementation of this strategy, efforts will be made to train and recruit adequate anaesthesiologists as well as anaesthetic clinical officers at diploma and BSc levels. Efforts will also be made to ensure that there is a clear career path for anaesthesia clinical officers.

Theatre will be led by a **theatre manager**, (a RN trained as theatre nurse and years of experience) and there will be a theatre coordinator who will be responsible for the day to day running of the theatre.

Porters plays an important role in theatre in transfer of patient from the ward to the operating theatre and vice versa to avoid procedure delays and delays in post-operative care. Porters must be available and be trained in recognizing medical problems/emergencies and how to respond to such emergencies during patient transfer. They should have good communication skills and respect of medical ethics and be trained in how to communicate with and handle persons with disabilities.

Cleaners must be properly trained to understand why they must be meticulous in what they do. One cleaner must be available per theatre per shift to avoid unnecessary delays.

3.3.6 Other required staff

3.3.6.1 Nutritionists

Nutritionists will be very helpful as part of patient rehabilitation. Nutritional needs are variable depending on condition and individual needs. Even when a hospital cannot afford, patients and guardians need to know what is required for the patient's wellbeing and swift recovery. The care should continue at nearest the clinic and at home after discharge from hospital.

3.3.6.2 Physiotherapists

Physiotherapy is essential in surgical patients and many medical conditions, for instance stroke patients and should start as soon as patient's condition is stable. Physiotherapists and occupation therapists must be available for services for all surgical patients and all patients in HDU/ICU.

3.3.6.3 Psychologists/Social Workers

Psychologists' services are important in emergency care. Patients must be supported psychologically especially when they have encountered traumatic experiences such as GBV, lose an organ or limb or live with a chronic condition. Guardians who lost loved ones and the ones that might not be able to see a patient for infection prevention reasons must be supported. Improvement in these services is essential. Social workers will also support to ensure that the hospital is catering for all genders and diversities and will follow up on cases that need support.

3.3.7 Out of hospital care staffing

The family care concept as primary and secondary prevention is explained in the previous chapter. The creation of these cadres requires a curriculum development, training, protocols and guidelines, continuing professional development. There is need for an act of parliament **to establish an out-of-hospital care system with its own financial, human resources, infrastructure, fleet etc.** The MoH in consultation with the health training institutions will develop technician curriculum to facilitate seamless transition to the degree/professional program. The training and scope of practice should be different for technicians (e.g., nurse midwife technicians, clinical technicians), professionals (nursing officers, clinical officers, doctors) and specialists (EM specialists, anaesthesiologists, surgeons).

The second curriculum development and concept development will include that for caring chronically ill patients at the community level. This enlarges the role of the primary health care system including nurses, clinical officers, and doctors to guide communities and care for those with chronic conditions.

Community leaders

The community leaders are different depending on the setting. They can include district council/city council leaders, village leaders, religious leaders, patient advocacy groups, Ministry of Education staff, Ministry of Civic Education and national unity, first aid training agencies (e.g., Red Cross), Community health care providers (e.g., HSAs and community health nurses), fire department, police, regulatory bodies, and professional associations. Community leaders could also include leaders of organisations for persons with disabilities, women's organisations as well as other Community Based Organisations (CBOs). A **family physician** will be located at the district level who will coordinate programs and response for the communities and primary health services.

Certified first responders

The trained first responders will be a subset of the certified first aiders who are specifically equipped to respond to emergencies in the community. They will need a functional communication system, standardised documentation system, first aid kit, safety equipment, mentorship program and allocation at critical areas based on statistics for known emergency prone areas. In many countries, the Red Cross has these volunteers and organizes the whole community emergency care system. We will work with the Red Cross and other stakeholders in implementation.

Professional responders

They fall in several categories as follows:

- Out-of-hospital care technicians
- Out-of-hospital care professionals
- Health care professionals and health care specialists with out-of-hospital care training
- Family health professionals for the continuous care and secondary prevention.

Key considerations of Out of Hospital Care

The whole training in the out-of-hospital care must be developed. It includes training of community volunteers and obligatory first aid training for car and moto-bike drivers for first attendance on scene, qualified first attenders and emergency coordination hub administrators. This can be done together with an organisation that will lead the program on behalf of the MoH for instance the Malawi Red Cross Society.

The family health system led by Family health specialists or physicians should be fully developed and implemented. Partners can assist to develop this program of continuum of care in their target districts.

3.3.8 In-service training, longitudinal mentorship, and continuous professional development

Various courses in emergency care will be conducted by the clinical practice and emergency management divisions in collaboration with the relevant directorates and professional groupings or

associations. All in-service trainings offered by different programmes. These courses will be harmonised and those that address special skills for specific cadres, groups, and individuals with the aim of improving standards and quality of emergency and critical care in Malawi will be promoted. These in-service training courses and certification will include Advanced Paediatric Life Support (APLS), ETAT, Neonatal resuscitation, the COIN Course, Post-abortion care, AIME, POCUS, ACLS, BLS, ATLS +PIC, WHO BEC and BEMOC. Courses will also be organized for management and coaching staff, to improve skills in coaching management and research. There will be short courses in research, mentorship programs in research and management, and ethics and medico-legal aspects of emergency care. The staff involved in training will undergo courses to improve pedagogical skills.

Long-term and in-service training will be supplemented and supported by longitudinal mentorship which has been shown to contribute to the improvement of certain quality of care outcomes especially compared to training alone.^{19,20} Mentorship expands past supportive supervision which is skills and professionalism focused to an emphasis on the mentee's individualized learning and career focused with empowering the learner. Mentorship will be provided by emergency and critical care trained health care workers at the hospital, primary care and community levels.

The MoH will engage with leaders of healthcare education institutions to explore how health care professional teachers can be further involved in assisting their ex-trainees in their life-long professional improvement through CPD, continuous professional development and online mentoring.

Career progression:

The emergency department will have registrars and medical officers who will specialize in different specialties to become specialists in paediatrics, internal medicine, emergency medicine, obstetrics and gynaecology, surgeons, and others. The specialists will also subspecialize in various subspecialties such as cardiology, trauma surgery, emergency medicine, critical care, pre-hospital care, palliative care and others.

3.3.9 Training, Support and Mentorship

It is vital that staff caring for patients has the knowledge and skills necessary for improved clinical practice and performance. In emergency and critical care, adequate knowledge and skills can decide on a patient's life or death. During the implementation of this strategy opportunities for health workers will be created to update their skills and learn new skills that integrates all cadres and across the continuum of care including out of hospital providers such as family doctors, community nurses and midwives. The MoH will strengthen medical education, nurse education, development of specific clinical skills, medical devices training and encourage teamwork at all levels.

The Ministry and its partners will explore ways of including simulation technologies like skills labs to enable learners to practice both as individuals and as members of inter-professional teams, developing expertise in progressively challenging situations, free from concerns about patient safety.

¹⁹Rowe AK, Rowe SY, Peters DH, Holloway KA, Chalker J, Ross-Degnan D. Effectiveness of strategies to improve health-care provider practices in low-income and middle-income countries: a systematic review. *Lancet Glob Heal* 2018; 6: e1163–75.

²⁰Schwerdtle P, Morphet J, Hall H. A scoping review of mentorship of health personnel to improve the quality of health care in low and middle-income countries. *Global Health* 2017; 13: 1–8.

Simulation-based preparation should be designed to enable self-assessment, teamwork, and self-regulated learning, which will prepare future practitioners to sustain their life-long professional development.

All emergency and critical care clinicians and nurses should have attended the **Basic Emergency Care** course developed by the WHO/ICRC and send some clinicians to other institutions in countries such as South Africa where emergency medicine is advanced while developing the curriculum in the country. The strategy will provide career training at each level of care also promote long-term continuous improvement, training and mentorship especially for district hospitals and below, and community-based care.

3.3.9.1 Training for Intensive Care Units /High Dependent Units staff

The training will start immediately with short-term courses while developing the long-term career paths with longitudinal specializations and certifications for critical workforce specialities such as intensivists which are needed for high quality and decentralized care delivery. In the short term, a four-week inter-professional training course with follow up mentorship will be offered to all ICU and HDU staff with official recognition. The short course will include clinical case management of common cases admitted to ICU/HDU, team building, and equipment use and care. In the long term, the Ministry will work with universities and colleges to develop the curriculum for a degree program in Emergency & Critical Care Nursing for NMTs and a masters' course. The MoH will integrate emergency and critical care into the general curriculum of nurses/midwives and clinicians while at the same time developing/strengthening the specialised courses in emergency and critical care. It will also be critical to increase the numbers of Anaesthetic Officers and develop a clear career path for them. Furthermore, the Ministry will create of a professional career for nurse practitioners in emergency and critical care, and paediatric emergency and critical care to build this workforce. There will be specialization as surgical, scrub nurse, paediatric nurse. The MoH will also strengthen the bachelor programs for clinical officers creating career paths as specialists in obstetrics, paediatrics, emergency and critical care, infectious diseases, etc., and make sure the clinical officers are supported during their studies.

3.3.9.2 Theatre

The Ministry will make sure all theatre staff have basic skills in theatre & emergency nursing and clinical care, resuscitation, and Basic & Advanced Life Support. In short term, a short course to systematically train nurses in theatre procedures will be developed and ensure that all relevant nurses are trained. Long term plans would be engaging training institutions to develop a post-graduate theatre nursing curriculum and implement widely throughout Malawi.

3.4 Standard equipment: procurement and maintenance

A comprehensive list of emergency and critical care equipment with specifications will be developed and agreed upon with experts in their field. Specific brands and technical specifications will be recommended for use throughout the country and maintain 3-4 brands per service delivery level. The recommended brands should be tested for resilience in tropical climatic conditions. Procurement of equipment should include adaptation and protection for the in-country power supply challenges,

service contracts for high capital and complicated equipment, and for general medical equipment there should be provision of spare parts and consumables for 2 or more years after the warranty depending on the expected lifetime of the equipment.

The MoH department that is responsible for standardization of equipment coming into the country shall be strengthened. To maintain standards in the equipment for emergency and critical care services, there is need to establish a Trust (like CMST), established under an Act of Parliament, which will be responsible for control and regulation of standards of equipment coming into the country or create a dedicated division under the CMST to deal with issues of equipment. The Trust will also be responsible for stocking spare parts and consumables for all equipment used in hospitals to ensure consistent and reliable supplies. An equipment policy will be developed and should clearly stipulate the procurement, commissioning, decommissioning and the disposal guidelines of equipment. Long-term training opportunities along with longitudinal mentorship will be provided for biomedical technicians and engineers with specialization paths for specific equipment areas.

3.4.1 Oxygen supply systems

Oxygen concentrators remain a reliable and cheap source of oxygen for primary care facilities in Malawi. However, for secondary and tertiary care facilities, a more reliable oxygen supply system in form of a gas plant is needed. Such a plant, of varying capacity depending on the need of the health facility, should be able to supply oxygen, medical air, nitrous oxide (for tertiary hospital) and vacuum for the hosting facility, and be able to fill oxygen gas cylinders for hospitals and health centres in its catchment area. The gas plant, should be able to monitor humidity, O₂ concentration with safety cut off if O₂ concentration falls below 93% and monitor pressure. A Biomedical engineer team should be trained and assigned to monitor and respond to any fault to ensure uninterrupted gas supply and long life of the machines. To maintain compatibility, all oxygen cylinders in the country should be of the Bull Nose system. There should be a secure cylinder manifold system connected to the main supply system with capacity to automatically supply the hosting facility's 24-hour requirements in case of loss of function of the gas plant.

Detailed plans for investment in the scale of oxygen production can be found in the Malawi National Medical Oxygen Ecosystem Scale-Up Roadmap. This roadmap describes the optimization of oxygen distribution and logistics; capacity building of the clinical workforce and technicians; supply chain for oxygen equipment, accessories, consumables and spare parts and data management. By informing the oxygen ecosystem from source to patient for the ECCS, the two are interconnected in the quest to strengthen the health service delivery across multiple areas and levels of the health system.

3.4.2 Out-of-Hospital care equipment

Emergency care in out-of-hospital care is very critical if lives are to be saved and disability prevented. The Ministry will explore the possibility of making it mandatory for every driver to undergo a first aid training and ensure that every car should be equipped with first aid boxes. Trained first responders will have some basic equipment like spinal immobilisation boards, neck collars and some splints and all ambulances should be equipped with an oxygen system that is functional all the time in addition to patient monitors, communication systems and boxes for essential equipment and drugs. The family

health professionals should be based at the health centre or clinic and should have all the necessary equipment for them to be able to do stabilization, basic investigations, and follow-up.

3.5 Medicines, Medical supplies, and ordering systems

Essential medicines are a main component of medical services. During the implementation of this strategy, the Ministry through the division responsible for pharmaceutical services shall ensure that there is very good coordination with the Central Medical Stores Trust (CMST). Emergency and critical care data systems will be linked to complementary services such as radiology systems, pharmacy, and Electronic Medical Records Systems (EMRS) ensuring that information about the patients is available across the services in real time. This will help in the quantification of medicines and medical supplies at the facility level as well as the National level. All health facilities shall have functional and well-trained drug and therapeutic committees (DTC) to monitor all essential medicine movements and ensure that all drugs are accounted for at every point across all health delivery points. To achieve this drug consumption data shall be linked patient symptoms and diagnosis for the data to support the quantification of medicines and supplies for emergency and critical care services. The Division of clinical practice will work with other relevant divisions to ensure that the Logistic Management Information System (LMIS) and the District Health Information Software 2 (DHIS2) are linked and that the DTCs are trained on how to use data to monitor rational use of essential drugs.

At national level, there shall be a vibrant National Medicine and Medical Supplies Committee that will aim to ensure consumption data becomes a major element in quantifying medicines and supplies. The committee shall also ensure that policies on access to essential medicines are reviewed and that policy documents such as the national essential drug list and standard treatment guidelines are updated every three years and the availability of the drugs monitored. As a critical component of this strategy, the committee shall ensure that rational use of essential medicines and practices that promote the reduction of resistance of essential medicines are promoted.

3.6 Information Systems and research

Health information allows decision-makers at all levels of the health system to serve individual needs of the patients, identify problems and needs, make evidence-based decisions on health policy and allocate scarce resources optimally.²¹ Emergency and critical care data is an important element for improving the quality care. The WHO definition of quality of care is *“the extent to which health care services provided to individuals and patient populations improve desired health outcomes. In order to achieve this, health care must be safe, effective, timely, efficient, equitable and people-centered.”*²² To improve patient care and treatment for emergency and critical care and beyond there is a need to make patient level data readily available at the point of care to give health care workers the tools to diagnose and treat patients with high quality care.

²¹World Health Organization. Health Metrics Network Framework and Standards for Country Health Information Systems. Geneva, 2008. <http://www.healthmetricsnetwork.org>

²² World Health Organization. Maternal, Newborn, Child and Adolescent Health, and Ageing. <https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/quality-of-care>

Monitoring the implementation of the strategy and making necessary adjustments will also require collection and analysis of data. Indicators for the strategy and implementation will need to be entered into DHIS-2 and followed for actionable implementation improvement and case for service development. Data will also be used to conduct research for developing new and more efficient ways of training and providing emergency and critical care. The Ministry of Health will develop standardized documentation, quality measurement tools, standard review systems and communication systems to ensure the needed data is made available and integrated into the DHIS2.

3.6.1 Standardized patient documentation

Documentation of patient records should be standard across the country for facilities at the same level. For instance, all trained first responders will use the same forms when managing and referring patients. The same will apply for professional out-of-hospital providers, emergency departments and critical care units. The documentation should capture processes that take place at each level. For instance, triage, assessment, treatment, diagnostic work-up and discharge /referral. The documents will also capture general details on gender and disability for ease of analysis of data based on these categories.

3.6.2 Digital Health Systems

The strategy proposes the introduction and or scale up of electronic systems and other digital medical technologies to support emergency and critical care services. Electronic systems will enable clinical care teams to deliver care more efficiently with access to population level data and patient records along the continuity of care.

3.6.3 Electronic Medical Records (EMR)

In the medium and long term, the strategy proposes the introduction and roll out of Electronic Medical Record (EMR) systems in the provision of emergency and critical care services. The EMRs shall be designed to allow seamless flow of records from the out-of-hospital care provider to the emergency and critical care provider and back to the community health provider. This will ensure that up and down referral equips the next team with adequate information for safe patient care.

The EMR system shall serve clinical, administrative and research purposes:

- The functions of the EMR will include monitoring the patient flow, managing clinical workflow, patient appointments, retrieval of patient records such previous test results and procedures, sharing of patient records across departments, services and hospitals, managing patient handovers and referrals, updating and sharing of electronic clinical reference materials (standards, protocols, etc.) and providing custom quality of care analytics (waiting times, patient outcomes, re-attendance etc.).
- The administrative functions of the EMR will include personnel management, tracking of medicines and medical supplies and monitoring of diagnostic and therapeutic resource utilization.
- Research is critical in the improvement of the quality of emergency and critical care. With EMR it is possible to do this without spending too much time outside clinical care. This will most

likely encourage personnel to conduct and utilise research in this field to answer different clinical as well as the administrative questions related to emergency and critical care services.

3.6.4 Telemedicine

Telemedicine will be used to improve coverage and quality of care across the country. The key components of the system shall include teleconsultation, emergency call and alert, decision support, electronic clinical guidelines, and follow-up care service functionalities. There will be dedicated, experienced staff inside the country and will be supported by international experts. The Clinical Practise and the Emergency Response Management Divisions will work with the Digital Health Division to ensure that these services are secure and efficient.

3.6.5 Systems Interoperability

Emergency and critical care services are provided as part of the general health and health support services. Emergency and critical care systems will be linked to complementary services such as radiology systems (such as the PACS), pharmacy and EMRs. Interoperability of systems will ensure that information about the patients is available across the services in real time. This will help to improve patient outcomes and continuity of care.

3.7. Governance, Leadership and Continuous Improvement

3.7.1 Governance and Coordination of Emergency and Critical Care Services

WHO states that leadership and governance means that strategic policy frameworks exist and are combined with effective oversight, coalition building, regulation, attention to system design, and accountability.²³ The Ministry of Health just underwent a functional review that have streamlined the roles of different departments in order to work on effective implementation through strategic policy framework. The Ministry of Health acknowledges challenges in leadership and governance at all levels of the health system. The Health Sector Strategic Plan II aspires for better coordination within the MoH. This is to bring efficiency among the health sector where institutions have overlapping responsibilities.

Within this context of the functional review, the implementation of emergency and critical care strategy will require the development of strong clinical leadership and governance system. This will ensure establishment of proper structures, development of relevant policies and guidelines to ensure high quality emergency and critical care services. The focus areas will be the:

- Development and dissemination of evidence-based policies and transparent resource allocation.
- Development of responsible and strong Clinical Leadership to address public health priorities
- Development and testing of efficient and effective service provision arrangements, regulatory frameworks, and management systems

²³World Health Organization. Everybody's business: strengthening health systems to improve health outcomes. Geneva, 2007. https://www.who.int/healthsystems/strategy/everybodys_business.pdf.

- Development and equipping community leaders to encourage participation and legitimate exercise of beneficiaries'/citizens' voice in emergency and critical care services.

This strategy proposes improvement in different pillars of the health system such as infrastructure development, human resource development and careers, equipment and maintenance, drugs and supplies, community emergency response, secondary prevention and family medicine and information management. The Emergency Medical Services and Disaster Response division of the Curative and Rehabilitation department will ensure good health governance and effective coordination to ensure equitable availability and accessibility of emergency and critical care services. Inside the curative department, the Clinical Practice and the Emergency Response Management Divisions will oversee the functioning of the emergency and critical care systems working in close cooperation with all relevant government departments and other organizations to develop the out-of-hospital care systems. The Clinical Practice Division will provide comprehensive governance bringing together divisions, disease specific donor -funded programs, professional bodies, and partners.

The MoH will form the National Steering/Expert Committee and technical sub-committees on Emergency and Critical Care Services comprising different cadres from different disciplines in the delivery of health services. The committee will be mandated to advise as well as help implementers in order to achieve the work outlined in this strategy. The Secretariat of the committee will be under the Department of Curative and Medical Rehabilitation Services. It will include members from the private sector, partner organisations, organisations of persons with disabilities (to give advice on disability issues in healthcare), academia, and professional and regulatory bodies. The out-of-hospital care system will require proper regulation and licencing for first responders as well as volunteers. This will require an act Parliament that will among other things make the first aid course mandatory for all public servants and car/bus drivers.

The technical sub-committees shall champion the development and monitor the implementation of relevant clinical practice standards for different specialties and other areas that affect the practice of care such as infrastructure, medical engineering, and others. The technical sub-committees will be required to develop plans with milestones and progress indicators. Each technical sub-committee will be required to report progress to the National ECCS Steering Committee on a biannual basis. A yearly review meeting will be conducted to track progress in the implementation of the strategy.

3.7.2 Professional bodies and networks

The strategy proposes the organization of well-managed clinical local networks to ensure that health workers on all levels are coached, mentored, and supported by well-experienced professionals in different fields of practice. In addition to in person observations and mentorship, there will be a telemedicine platform where patients can be discussed with specialists if not physically present. Professional associations both local and international will play a major role in developing the standards, capacity building, mentoring and trainings.

The ECCS will ensure that good governance is a core component of resilient emergency and critical care systems. While government is the primary driver of governance, non-state actors – from

practitioners to civil society – will be critical in making sure that the Emergency and critical care systems achieve goals of improved health status, improved health system responsiveness to people's expectations, and reduced financial risk to users of the system.

3.7.3 Development of excellence in clinical and administrative leadership

To achieve the objectives of this strategy, health care facilities need to be managed by a team of competent administrators and experienced clinical leaders. This strategy will aim to develop excellence in leadership to have highly skilled, experienced, and motivated clinical leaders and administrators. Efforts will be made to create a well-supported environment so that clinical teams are enabled to work efficiently. Those leadership and managerial skills will be developed based on proven frameworks of such as the Clinical Leadership Competency Framework (CLCF) or similar frameworks. The CLCF compels clinicians to work on their leadership skills throughout their lifetime during their clinical career. The management course for those delivering and supervising emergency and critical care services will be taught through modular courses that will combine both knowledge and skills acquisitions.

To develop clinical leadership, it is important not only to focus on clinicians and nurses but also other cadres that work for patient care. The aim will be to produce clinical leaders who are experienced care providers and competent in each of the five leadership domains namely demonstrating personal qualities, working with others, managing services, improving services, and setting the direction.

Administrative leaders will be chosen on the basis that they are competent in promoting professional values and ethics, able to identify incompetent or sub-optimal practice, investigating, and taking corrective action. They should also be able to use relevant information to improve practices and services. They will go through a specific modular administrative leadership course combined with proof of application of the knowledge.

The clinical as well as administrative leaders will ensure, for example:

- That essential equipment and drugs are available, and equipment regularly maintained
- That in collaboration with the District Commission, human resources are increased, and people are at the place where they can make the greatest impact
- That their leadership is transparent, and staff is integrated in all important discussions

To ensure that knowledge and skills are appropriately transferred from experienced leaders/practitioners, all staff involved in teaching and mentoring others will need to be trained on how to teach and how to provide effective supervision. This means promoting teaching and mentoring models that prohibit intimidation, shame, blame and sexual harassment and encourage teamwork and support.

Examples of good clinical and administrative hospital leadership in day-to-day work:

- Ward rounds are done regularly together, nurses and clinicians; patient information is discussed with the relevant specialists if needed
- Patients are treated inclusively and with dignity and respect and feel safe in the hospital. They are aware of their rights, that they know how to complain and that their complaints are taken seriously

- Handovers are conducted to effectively share patient information with the next shift and questions about patients are discussed among the team and with specialists when needed
- Files are complete as per file policy
- All wards have ward meetings and quality improvement teams
- Regular continuous professional development trainings of good quality are done and followed up

3.7.4 Continuous Quality Improvement and care accountability

3.7.4.1 Staffing for Safety and high-quality care

Evidence has shown that burnt out or demotivated health workers can have an adverse effect on their personal as well as their patients' safety. Evidence has also shown that 12-hour shifts reduce the capacity of health workers to adequately monitor patient and react to danger signs. In the implementation of this strategy, the MoH will support all facilities offering emergency and critical care services to ensure that these services are prioritised and that adequate health workers are recruited or allocated to ensure that health workers can work shifts that allows health workers free from burnouts.

To enhance motivation of staff members working throughout the facility and especially in emergency and critical care, the following measures are proposed:

- Priority for allocating housing near to the facility is made for staff working overnight, on call or in emergency and critical care services.
- Eventual provision of transport to and from the hospital when finishing afternoon shifts and starting night shift.
- Provision of places to recover- space including a small kitchen- as health workers meet many depressing situations.
- Rooms for doctors /clinicians/nurses with internet access so that they can update their knowledge, search symptoms and signs and the management of different diseases. They can also use the internet to consult different specialists online.
- Care of carers groups should be institutions in each facility not only for HIV but also to provide psychological support for staff.

3.7.4.2 Defining care standards in all specialties

Accompanying this strategy will be the update of national clinical standards of care developed by experts of each department of health care. The standards will be used as a basis for measuring clinical performance. Experienced local experts will review and update clinical standards and guidelines in line with international standards and guidelines. The experts will recommend the steps for accreditation of Malawian Hospitals to internal standards like those of the Council for Health Service Accreditation of Southern Africa (COHSASA). The experts will also review and recommend courses that are mandatory for someone to practice in any specialty. Use of evidence-based research will be promoted in all areas to ensure that all guidelines, standards and algorithms are based on up-to-date clinical evidence. Updating clinical standards, guidelines and algorithms regularly will help to ensure that clinical practices as well as procurement of drugs and equipment is based on the set standards. All departments such as the surgical, anaesthesia, obstetrics and internal medicine guidelines will be required to update guidelines for use in Malawian hospitals.

To guide the caregivers, this strategy requires updated guidelines or policies for areas such as improved patient safety, gender-based violence, oxygen therapy, end-of-life care or the handling of patients with suspected contagious infections, maintenance of biomedical equipment, record keeping, linen handling, housekeeping etc.

3.7.4.3 Clinical Audits and Medical Certification of Cause of death

Clinical audits and Medical Certification of Cause of Deaths help doctors, nurses, and other healthcare professionals to measure the quality of the care they offer. They allow to compare their performance against the standard and identify opportunities for improvement. They also allow to discuss with specialists and prepare some cases for telemedicine consultation. During the implementation of this strategy, weekly clinical audits will be instituted as a core component of best practice for improved performance. At each hospital, a committee will be established to ensure that Clinical Audits and Medical Certification of Deaths are being conducted in each department. An electronic database will be established for both death audits and Medical Certification of deaths. The clinical audits will not only focus on deaths but also present cases where health workers have performed well or present unclear cases for discussion so that health workers will be motivated for best performance in clinical care. For the clinical audits to achieve its intended results, the Department of Curative and Medical Rehabilitation Services shall establish an expert committee that will harmonise and promote the conduct of clinical audits, death audits and medical certification of cause of deaths in the hospitals from time to time. It will be critical to establish a National Confidential Enquiry into Patient Outcomes and Death (NCEPOD). This will ensure that there is transparency and accountability in the management of patients in the hospitals. This has the potential to minimize patient risks and improve clinical practice.

3.7.4.4 Patient and guardians' experience and patient centred care

If the MoH is to offer the highest quality emergency and critical care services, it is important that health workers offer services that are patient and family centred. This can be achieved by working in partnership with patients and guardians. This helps to gain a better understanding of the priorities and concerns of those who use the services by involving them in the work, including into policies and service planning. For facilities to gain the views of patients and guardians, this strategy proposes the evaluation of the current ombudsman strategy for best practices and amplify them and ensure that teams are set to deal with issues coming out of complaints and compliments boxes.

Chapter 4: Implementation Arrangements

4.1 Policy requirements

To achieve the effective and efficient implementation of this strategy, the following conditions need to be met and policies need to be reviewed and reoriented:

- Commitment by both government and its development partners/donors to system improvement strategies as opposed to disease specific oriented interventions. Reduced morbidity and mortality of patients can be achieved not only through continuous education and training of staff but also through investments in infrastructure, efficient clinical and administrative leadership, uninterrupted availability of essential drugs and increased use of new technology.
- Improvement in personnel performance to achieve efficiency in the provision of comprehensive care for patients on the scene, while in transit, in facilities and back to the communities. One of the strategies to achieve this will be the development of efficient clinical and administrative leaders that will guide, support, inspire and empower service providers. In addition, the medical teams should receive regular and up to date certification in life saving courses such as Pre-Hospital Trauma Life Support (PHTLS), basic life support (BLS), Advanced Trauma Life Support (ATLS) and Advanced Cardiac Life Support (ACLS).
- Commitment to reduce response time for any emergency and life-threatening conditions. A 95% target for response time of 15 minutes in urban areas and 20 minutes in rural areas for ambulances or for managing life threatening emergencies should be set and implemented. This can be achieved through strategic positioning of ambulances for the benefit of patients. Ambulances should be in strategic positions along highways throughout the country. There should be use of GPRS to locate and dispatch ambulances and use of the medical dispatch priority system (MDPS).
- Engagement in strategic partnership with private entities (not for profit or profit making) and other players in the health sector, especially in the provision of services such as maintenance for diagnostic and treatment equipment, or even the provision of pre-hospital services that include ambulances equipped with ICU level services.
- Creation of an enabling logistic environment for efficient emergency and critical care services such as the development of a new Trust or a separate department in the CMST responsible for procurement of emergency and critical care equipment, plus spare parts and their appropriate consumables. This may help to improve the efficiency of the CMST as the CMST will concentrate on the procurement of drugs.

4.2 Policy strategy and guidelines revisions

The strategy will require the review, updating and refocusing of already existing policy documents and guidelines such as:

4.2.1 Capital Investment Plan (CIP)

To achieve the goals outlined in this strategy, the MoH and its partners will require to review the Capital Investment Plan to include rehabilitation of emergency and critical care services infrastructure in secondary and tertiary hospitals and make sure all emergency services including the first attenders have the necessary equipment.

An assessment to understand the emergency and critical care infrastructure needs of all referral hospitals in the country must be conducted. Priority will be given to government referral facilities. The assessment will be followed by ranking and prioritizing exercise based on population and the number of emergency cases. Tertiary hospitals should be in a top priority because they are models and training centres. The planning will be done including the staff and the local authorities and using modern simulation techniques. This strategy requires the restructuring/renovation of hospitals to provide space for an optimized patient flow and to comply with international IPC standards.

The Department of Curative and Medical Rehabilitation Services and the Infrastructure Unit at the Ministry of Health headquarters will work closely with the practising health workers from different specialties to develop/review floor plans of different emergency and critical care units. Since the MoH functions are devolved, the MoH will therefore provide technical guidance to district and other stakeholders at all levels on construction procedures and standards; rehabilitation/upgrades /constructions of different units, mobilization of resources for maintenance, and ensure quality assurance on infrastructure development at all levels. All emergency department and critical units such as short-stay, theatres, HDU/ICUs etc. should have appropriate floor plans that can be modified depending on emerging needs.

The Department of Curative and Medical Rehabilitation will be required to submit every year to the Department of Planning the rehabilitation plan for hospitals so that they can be submitted to Parliament for approval. It should be mandatory for each district to have a well-thought rehabilitation plan so that facilities provide care in safe conditions with reduced risk of hospital acquired infections.

4.2.2 Policies and standards for out-of-hospital care

The division for emergency response and management will work with different partners to strengthen the call centres (Chipatala cha pa Foni) for the toll-free numbers and introduction of the GPS system for the management of the fleet. Together with the medical rehabilitation division and community health, the concept of the community health/ family health will be developed.

4.2.3 Malawi Human Resources for Health Strategic Plan

Emergency and critical care services are labour intensive and need to attract health workers that are passionate. Assessing the existing HR capacity to provide ECCS and recommend specific numbers/ratios of cadres to beds will be carried out. It is important to support doctors and clinical officers who will continue to become specialists in surgery, obstetrics, orthopaedics, internal medicine, paediatrics, emergency care, family medicine and intensive care and anaesthesia during their studies and ensure that they will be employed in their chosen career. Similarly, nurses passionate in ECCS will be supported to advance their careers.

Since the paramedical career is not well developed in Malawi and will be the back-bone for an efficient and effective out-of-hospital care, the MoH will seek the approval of Parliament to develop this career. A curriculum of the paramedics will need to be developed and implemented in collaboration with clinical practice regulatory bodies before initiating the training.

- All career paths shall be reviewed and continued innovative ways to deliver the courses will be explored to ensure that trainees are able to put theory into practise.
- All clinical and administrative leaders will be required to undergo a leadership course covering clinical and administrative issues such as procurement, ethical issues, human resource management etc. Refresher courses will be organised to ensure efficient leadership and governance in the clinical setting. They will continue working while learning to motivate staff, how to teach and coach, how to implement quality improvement projects etc.

This plan needs to be updated to include the development of critical cadres for delivering efficient and effective emergency and critical care services such as paramedics, specialised nurses, doctors, clinical officer etc.

4.2.4 Oxygen Ecosystem Roadmap

The MoH and its development partners are developing a Roadmap to accelerate the availability of safe medical oxygen in the country. This roadmap has been designed to effectively contribute towards the attainment of efficient emergency and critical care systems in Malawi.

4.2.5 Equipment and maintenance

The standard equipment list needs to be updated with the help of national and international experts to comply with standard criteria as further explained above including the out-of-hospital care. For each equipment, the standard will be developed and the periodicity of preventive maintenance determined. There will be a need to have a central procurement unit (Trust similar to the CMST) for all equipment, the supplies as well as the spare parts. It will also be mandatory to update the donations guidelines. A standard electronic inventory will be mandatory for all district hospitals. The Ministry will explore the possibility of involving the private sector in the maintenance of medical equipment.

4.2.6 Drugs and supplies policies and standards

The committee will develop standard tools to guide the users. It will also ensure that data from the DHIS2 and LMIS are reconciled and transparent so that there is the possibility to match drug consumption and diseases. In each hospital, the drug and therapeutic committee will be strengthened to ensure that they become the advisors for the hospitals on the rational prescription and use of essential drugs. The committee will work towards ensuring transparency and accountability in the use of drugs in all hospitals. As CMST is mandated to procure and supply drugs for health facilities in Malawi, its performance will need to be reviewed time to time and actions determined to ensure uninterrupted supply of drugs.

4.2.7 Guidelines and eHealth

Support systems are important in delivering quality emergency and critical care services. This strategy will promote the use of technology to enhance the management of critically ill patients. All areas where critically patients are managed for example, will be fitted with gadgets for easy communications between patients and their families even during isolation of a patient. The guidelines and algorithms will also be developed in electronic form so that updates and treatment changes can easily be made available.

During the rehabilitation of emergency and critical care departments there will be an integration of digital services and links, the development of the electronic patient forms and the digital support of differential diagnoses and treatments. There will be continued research between engineers, IT experts and clinical specialists to develop the relevant IT-solutions. There will also be the consultation of human rights experts to make sure that patients' rights are not violated when collecting and sharing information.

Chapter 5: Financing the Strategy

As everywhere in the world, financing health continues to be a challenge for the health system. However, efforts are in place to improve health financing. To implement this strategy and achieve equitable access to emergency and critical care services, a change in how the government plans, budgets and efficiently uses its funding for health is required. Similarly, donors, as well as partners financing health services in the country need to reposition themselves to this thinking. Apart from the regular donors, the MoH will engage in developing hospital partnerships with different professional or research institutions, international NGOs in order to deliver the best care that Malawians require.

Please see Annexes 5-7 for more detailed cost estimates for implementing the ECCS over the next ten years as well as the projected population reached over time.

Most of the interventions that have been proposed in this strategy are in line with the existing strategic documents as described in the table below. To ensure that the proposed interventions are implemented, the Department of Curative and Medical Rehabilitation Services will facilitate the review of these policy documents to include the funding for Emergency and Critical Care Services at all level. To ensure flexibility in the implementation, yearly costed plans will be developed by the department in liaison with district councils and development partners. The plans will be submitted to parliament for approval. It is expected that with good planning and prioritization by districts, the funding of this emergency and critical care strategy will be realised and the goals of this strategy will be achieved by the end of ten years.

This strategy proposes to review and update already-approved strategies to ensure that the ECCS needs are covered.

Table 2: Pillars of ECCS mapped onto costed national policies and strategies.

Pillars	Costed Plans	Possible Sources ideas
Infrastructure	CIP	GoM, District Councils, HSJF, World Bank, Donors, etc.
Equipment	CIP/Equipment	
Health Services delivery	Disease Control Programs (eg. Malaria, Tuberculosis, HIV/AIDS, Hospitals strategic plans, etc) Strategic Plans	Avoiding allocative inefficiency emergency care and intensive care is cross cutting-strengthening emergency systems and health systems
Medicines and Supplies	Essential Medicines list	
HRH	HRH Strategic Plan	
Health Information	HIS Strategy	
Digital Health/ Telemedicine	Digital Health Strategy	
Leadership and Management System	HSSP II	

Chapter 6. Monitoring and Evaluation

The Ministry will develop standard indicators that track patient access, utilization, quality of care and patient experience for emergency and critical care across disciplines with tracking them in all communities and facilities across the country. Standardized indicators help to evaluate the strides made in the provision of emergency and critical care in facilities and aggregated indicators will reveal national performance. It is critical to have special indicators to assess the inputs, process, output, outcome and quality impact of the interventions along with patient experience of the care received. Tracking service statistics at facility level using registers, standard admission and patient monitoring tools, supportive supervision tools, reporting formats, and an established schedule for regular supportive supervision will be very important. Data to support the M&E needs will be mined from the electronic systems. Paper based tools will be used where electronic systems are not available.

The generated data will primarily be used by the facilities for improving practise in emergency and critical care services. The Ministry will work to build capacity in data generation, management and use. Clinical audit committees shall be created to monitor data quality and suggest improvement activities.

These teams and departmental leadership will be trained and mentored on how to conduct and use clinical audits. Departmental mentors also need to be trained in clinical care reviews that directly affect the individual patient outcomes in addition to the general quality improvement. A learner-centred approach should be emphasised and taught well until it is widely adopted and utilised.

Furthermore, the MoH, in coordination with stakeholders, will conduct special studies and local assessments. All relevant indicators and registers will be integrated into the DHIS2. In line with this, facilities will be required to present in performance review meetings (annual or biannual) on the key indicators agreed upon. At the hospital level, each service provision area for emergency and critical care will be required to present progress to the hospital management teams. At the ward level, the ward in-charge will be required to agree on quality improvement measures and monitor progress.

There shall be a midterm review which will be followed by another review after the five (5) years of implementation of the strategy. These will help to check implementation status, challenges, new developments and the participants will, if necessary, modify the strategy for the next 5 or more years by incorporating latest developments and knowledge.

Annex 1: Implementation matrix

Objective 1 - Create out-of-hospital emergency and critical care services that are responsive to the current and emerging needs of communities including the needs of people with disabilities.				
Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Develop legislation for a fully functional out of hospital and interfacility care system				Initial act of parliament with support from community-based organizations, public institutions and training institutions with national and international partners
Advocate for legislation for a fully functional out of hospital and interfacility care system				MoH, international partners, training institutions
Develop national and district OHEC implementation plans				National and international experts, stakeholders and partners including academic institutions
Develop training program and certification for OHEC providers (paramedics/Emergency Medicine technicians)				National and international experts, stakeholders and partners including academic institutions
Conduct meetings to develop the district OHEC implementation plan based on the National OHEC implementation plan				National and local MoH, stakeholders and partners including academic institutions
Support the training program and certification for OHEC providers (paramedics and Emergency Medicine technicians)				National and local MoH, stakeholders and partners including academic institutions
Develop certification program for out of hospital providers				National MoH, stakeholders and partners including academic institutions, specific area experts
Develop certification of dispatch services				National MoH, stakeholders and partners including academic institutions, specific area experts
Initiate certification program of out of hospital providers				National MoH, stakeholders and partners including academic institutions, specific area experts
Initiate certification of dispatch services				National MoH, stakeholders and partners including academic institutions, specific area experts
Incorporate first aid training into school curriculum (from primary school); community trainings and key professional organizations (e.g. road safety council, police, teachers, CBO leaders, etc.)"				Initial act of parliament with support from community-based organizations, public institutions and training institutions with national and international partners

Develop standards for out of hospital and inter-hospital service delivery (e.g. human resource, infrastructure, transport, etc.)				National and international experts, stakeholders and partners including academic institutions and community members and care providers
Develop protocols for out of hospital communication system between dispatch and ambulance and between ambulance and facility				National and international experts, stakeholders and partners including public institutions and community members and care providers
Develop infrastructure requirements for out of hospital communication system between dispatch and ambulance and between ambulance and facility				National and international experts, stakeholders and partners including public institutions and community members and care providers
Operationalize out of hospital communication system between dispatch and ambulance and between ambulance and facility				National and local MoH, stakeholders and partners with funders
Develop essential medicines and equipment list appropriate for OHEC from the standards				National level with specialists from training institutions and community health
Develop an electronic medical record for OHEC				National level clinical and informatics experts and stakeholders/ partners
Develop monitoring and evaluation plan that include tools with a focus on delivery of high quality care (included in operational plan)				National level experts, HMIS and stakeholders/partners
Conduct research with subsequent improved iteration of implementation and operational OHEC systems				Health facilities, communities, training institutions and international partners in collaboration with local researchers
Advocate and collaborate with national road traffic office and local district assemblies for improvement in road infrastructure				National road traffic office. other partners, district councils, assemblies and community based organizations

Objective 2 - Improve the availability and the functioning of infrastructure for universal essential emergency and critical care services.

Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Conduct infrastructure needs assessment for emergency departments, theatres, HDUs and inpatient wards for different emergency and critical care services in district and Central Hospitals.				DCS, DPPD and partners
Develop and cost standardised ECCS designs				DCS, DPPD and partners

Conduct the review of the MoH Capital Investment Plan to include Emergency and Critical Care services needs (to be done after needs assessment has occurred)				DCS, DPPD, PAM, nursing
Conduct meetings to develop consensus for the criteria for prioritizing facilities for improving emergency and critical care services at all levels				DCS, DPPD, PAM, nursing and partners
Conduct meetings to develop standard infrastructure designs from WHO and other international validated tools for emergency departments considering appropriate patient flow and infection prevention as well as human dignity, needs of guardians, etc.				DCS, DPPD, District (DHMT, coordinator, DC)
Conduct Environmental Impact Assessment and Environmental Social Safeguard Plan for IPC				DCS, DPPD, District (DHMT, coordinator, DC)
Conduct meetings to develop infrastructure designs for purposely built isolation centres to be allocated in each district				DCS, DPPD, District (DHMT, coordinator, DC)
Develop infrastructure and equipment standards from WHO and other validated tools for emergency care, short stay units, HDU areas within wards, critical care areas (i.e. HDU, NICU, ICU, etc), isolation units and surgical areas in all hospitals and health centres				HTSS, DPPD
Construct or refurbish emergency care, short stay units, critical care areas (i.e. HDU, NICU, ICU, etc), isolation units and surgical areas in all hospitals in line with the developed standards				DCS, HTSS, District (DHMT, coordinator, DC)
Install hybrid power systems as sources of power in health facilities (escom & reliable backup either solar or generator)				HTSS (PAM), District Health Management Teams, DC
Ensure laboratory and radiology infrastructure and equipment in all primary and hospital areas including emergency care, HDUs and ICUs				HTSS (PAM), District Health Management Teams, stakeholders including tertiary care experts in laboratory and radiology, DC
Support ancillary infrastructure such as electricity (backup power supply within unit or power converter between sources), water, and piping for oxygen/medical gases				HTSS (PAM), District Health Management Teams, DC
Advocate for the recruitment and deploy adequate Biomedical Engineers at all levels				HTSS, District
Objective 3 - Improve accessibility to state of the art and high quality targeted emergency and critical care services.				
<i>Activity</i>	<i>Time Frame</i>			<i>Partners/Stakeholders</i>

	Short	Mid	Long	
Develop and review clinical identification standards for emergency and critical care service delivery to adults and pediatrics including triage systems in emergency care and medical early warning system to identify critically ill patients in wards or HDUs				National experts, national and international partners including academic institutions, DCS
Develop facility level guidelines and SOPs for patient movement between different services (Emergency, short stay, medical wards, HDU, ICU, NICU, etc)				National experts, national and international partners including academic institutions, DCS
Develop end of life care standards for emergency and critical care service delivery including medical and legal framework for withdrawal of life sustaining care				National experts, international partners including academic institutions, DCS
Develop guidelines/ standard operating procedures for symptom based illness with spanning across surgical, obstetrics, paediatric, medical emergency and critical care services disciplines				National and local MoH, national health experts and specialists, international partners including academic institutions, DCS
Finalize and launch the National safe Medical Oxygen Ecosystem Roadmap				National experts and specialists, health regulatory bodies, training and academic institutions, national and international partners
Strengthen in hospital/facility communication systems (i.e. patient call system, intradepartmental call systems) (equipment for new communication systems)				National experts and specialists, national and hospital level informatic teams, electrical and power specialists
Strengthen in hospital/facility communication systems (i.e. patient call system, intradepartmental call systems) (protocols and standards)				National experts and specialists, national and hospital level informatic teams, electrical and power specialists
Develop infrastructure requirements for in hospital communication system				National experts and specialists, national and hospital level informatic teams, electrical and power specialists
Operationalize in hospital communication system				National experts and specialists, national and hospital level informatic teams, electrical and power specialists
Objective 4 - Improve the availability at area of care and the functionality of equipment for diagnostic, treatment and transfer of patients in emergency & critical care areas at all levels of care				
Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	

Develop standard equipment list and consumables for emergency and critical care service at all levels				HTSS, National experts and specialists, clinicians and nurses
Review and adopt a comprehensive standard equipment list with specifications for emergency and critical care services broken down by facility level and type of services provided				HTSS, National experts and specialists, clinicians and nurses
Conduct a needs assessment on equipment for emergency and critical care at all levels in the district (sample 5 districts)				Local and national HTSS, DHMT, clinicians and nurses at district and hospital level
Developing a prioritisation criteria for emergency and critical care equipments				HTSS, National experts and specialists, clinicians and nurses
Assess and update capacity of financing mechanisms for medical equipment and maintenance				HTSS, PAM, National experts and specialists, national and international partners and donors, clinicians and nurses
Procurement of emergency and critical care equipments implementing facilities				HTSS, PAM, procurement, DHMT, DC
Ensure laboratory and radiological consumables are in stock for appropriate for each level of care				CMST, procurement, DHMT, DC
Develop TOR and operating protocols with training for all laboratory and radiological staff				HTSS, PAM, MoH, laboratory and radiology experts
Procurement of spare parts and consumables for planned, corrective and preventive maintenance				HTSS, PAM, CMST, procurement, DHMT, DC
Ensure for daily maintenance and cleaning checklists for all equipment				HTSS, PAM, DHMT, local coordinators, head of lab and radiology
Conduct regular refresher trainings for health workers to be able to use and troubleshoot emergency and critical care equipment				HTSS, PAM, DHMT, local coordinators, head of lab and radiology
Carry out board off for obsolete medical equipment				HTSS, PAM, DHMT
Carry out inventory management review for emergency and critical care equipment				HTSS, PAM, DHMT
Maintenance of medical equipment				HTSS, PAM, DHMT
Procurement of protective devices for EMS equipment (AVRI, AVS) for medical equipment				HTSS, PAM, procurement, DHMT, DC
Procurement of testing equipment for emergency and critical care				HTSS, PAM, CMST, procurement, DHMT, DC

Procure and distribute Point of Care testing equipment and consumables appropriate for each level of care				HTSS, DCS
Creation of forecasting system for tracking equipment use, maintenance, depreciation and replacement of equipment				HTSS, PAM, Digital Health/CMED, MoH, procurement, DHMT, DC
Objective 5 - Ensure the availability of essential emergency and critical care drugs and supplies and their rational use.				
Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Conduct meetings to review and update the essential medicines list to include all medicines and pharmaceutical supplies required for emergency and critical care services broken down by facility level and type of services provided				National experts and specialists, professional bodies, national and international partners and donors, private medical sector
Conduct meetings to review the procurement policy of medicines and pharmaceutical supplies at all levels				HTSS, PMRA, CMST and international partners and donors, private medical sector
Conduct meetings to agree on national and district level medication and consumable projection and consumption to quantify use				National experts and specialists, DHMT, pharmacy schools and professional bodies
Conduct capacity building for drug and therapeutic committees at all levels				National experts and specialists, DHMT, pharmacy schools and professional bodies
Create an ordering system procuring additional medications with emergency procurement of essential medications				CMST, MoH, DHMT, DCS, Digital Health/CMED
Develop uniform ward/unit stock lists				CMST, MoH, stakeholders and experts, DHMT, DC, hospital leaders
Develop uniform ward/unit stock systems				CMST, MoH, stakeholders and experts, DHMT, DC, hospital leaders, Digital Health/CMED
Create training, implementation and systems for forecasting and budgeting to ensure ongoing availability of medications				CMST, MoH, stakeholders and experts, DHMT, DC, hospital leaders
Conduct regular essential medicines prescription trainings at district and health centre level				CMST, MoH, stakeholders and experts, DHMT, DC, hospital leaders
Conduct regular essential medicines prescription surveys at all levels				CMST, MoH, stakeholders and experts, DHMT, DC, hospital leaders

Update the DHIS data with LMIS data to promote accountability in essential medicines use				HMIS, National experts and specialists, and international partners and donors
Develop/update comprehensive guidelines for drug stewardship				National experts and specialists, DHMT, district level clinicians and nurses
Objective 6 - Ensure the availability of well-trained and competent staff at all levels for efficient and effective management of patients requiring emergency and critical care services.				
Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Develop consensus on human resources needs for emergency care and critical care services including for surgical, anaesthetic, obstetric, paediatric and medical conditions including all ancillary staff				National experts and teams with assistance of human rights bodies, ombudsman's office, nursing and medical council
Lobby for the functional review to create appropriate establishment for emergency and critical care services at all levels				DCS, District Commissioners
Conduct meetings to develop evidence based standards for cadre to patients ratios for emergency and critical services by class of provider, level of hospital and patient acuity				Ministry of Health professional departments, medical professional bodies, paramedical professional bodies
Develop recruitment and retention plan of relevant cadres for the delivery of emergency and critical care services				Ministry of Health professional departments, medical professional bodies, academic institutions
Set training standards and curricula for emergency and critical care services by class of provider, level of hospital and patient acuity				Ministry of Health professional departments, medical professional bodies, academic institutions
Develop appropriate short courses for health workers to deliver appropriate surgical, obstetric and medical emergency and critical care services				Ministry of Health professional departments, medical professional bodies, academic institutions
Provide integrated inservice training for emergency and critical care by all levels				Ministry of Health professional departments, medical professional bodies, academic institutions, stakeholders
Conduct training sessions for health workers to deliver appropriate integrated surgical, obstetric and medical emergency and critical care services				Ministry of Health professional departments, medical professional bodies, academic institutions, stakeholders
Conduct meetings to develop integrated curriculum for short courses in surgical, medical and obstetric emergency and critical care services critical care to be taught in health colleges				Ministry of Health professional departments, medical professional bodies, academic institutions, stakeholders

Inclusion of the emergency and critical care training materials on the online Continuing Professional Development Platform				Ministry of Health professional departments, medical professional bodies, academic institutions, Digital Health
Facilitate recruitment and retention of relevant cadres to provide efficient surgical, medical, paediatric and obstetric emergency and critical care services				HR department,, Ministry of Health professional departments, medical professional bodies, academic institutions,DHMT, DCS
Support implementation of longer term training (e.g. residency, certificate, fellowship) relevant to cadre and specialty				Ministry of Health professional departments, medical professional bodies, academic institutions
Develop and support ongoing professional development, mentorship, coaching and clinical supervision and continuing medical education for all cadres				Ministry of Health professional departments, medical professional bodies, academic institutions

Objective 7 - Generate high quality inclusive data to monitor the provision and coverage of improved emergency and critical care services.

Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Develop standardized patient documentation for facilities at all levels (OPEC, district level, and central level)				National experts in electronic medical patient records and registers and human rights experts
Design and designate Key Performance Indicators (KPI) for both utilization of care and quality of emergency and critical care services at facility level through integrated measurement				CMED/digital health, MoH, emergency and critical care experts, DHMT and central hospital leadership
Create DHIS-2 report and system to track and report KPIs				CMED/Digital health, MoH, DHMT, relevant stakeholders, local coordinators
Support QA activities from KPI reporting and standards				CMED/Digital health, MoH, DHMT, relevant stakeholders, local coordinators, QMD
Implement and institutionise paper based medical records and protocols based on developed standards				CMED/Digital health, MoH, DHMT, relevant stakeholders, local coordinators
Develop and implement hospital wide electronic medical records system				National experts in electronic medical patient records, national and international IT and informatics partners
Conduct training in basic statistics and appropriate software packages for health workers/clinical researchers				National teams, training institutions, national and international partners

Objective 8 - Ensure the availability of well-trained and competent clinical and administrative leaders that are transparent and accountable and sensitive to the needs of people with disabilities, women, men, girls and boys accessing their services				
Activity	Time Frame			Partners/Stakeholders
	Short	Mid	Long	
Orientation of HR officer pertaining to the capacity building of clinical leadership and administrative courses for developing and building capacity for leaders at district level and central hospitals				National teams, training institutions, research institutions, national and international partners
Constitute and train the National ECCS coordinating committee and develop their TORs				National teams, training institutions, research institutions, national and international partners
Constitute and train the ECCS Technical Working Group and develop their TORs				National teams, training institutions, research institutions, national and international partners
Create system for ensuring facility and system wide leadership for emergency care and critical care				National teams, training institutions, research institutions, national and international partners
Constitute and train the National Confidential Enquiry into Patient Outcomes and Death (NCEPOD) committee at the Ministry of Health level				DCS, DPPD, QMD
Create Simulation based training and CPDs				National teams, training institutions, research institutions, national and international partners
Identify and procure materials with the right infrastructure for package of simulation based training and CPDs				National teams, training institutions, research institutions, national and international partners
Create simulation laboratories at each central and district hospital through utilization of training package, materials and infrastructure				National teams, training institutions, research institutions, national and international partners
Creation and implementation of Performance Management System for all levels/cadres of staff				HR, Government, MoH, DHMT, DC
Develop/review conditions of service for health workers in emergency and critical care departments				HR office, professional medical councils, human rights bodies
Conduct meetings to create platforms including e-medicine to discuss emergency and critical care services both local and international levels				DCS
Create strategic clinical networks and partnership				DCS

Optimize the conduct of death audits and medical certification of cause of deaths and create an electronic database with establishment of national death registry				DCS. NRB
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Annex 2: Contributors to the Strategy

Name	Position/Title	Place of Work
Dr Charles Mwansambo	Secretary for Health	MOH
Dr Queen Dube	Chief of Health Services	MOH
Dr Patrick Kamalo	Neurosurgeon	Queen Elizabeth Central Hospital
Dr George Chithope- Mwale	Director of Curative and Medical Rehabilitation Services	MOH
Mr Norman Lufesi	Ag Chief EMS Officer, Hospital Emergency and Critical Care Services	MOH
Dr Kondwani Kawaza	Consultant Neonatologist	College of Medicine
Dr Grace Katha Banda	Emergency Medicine Specialist	Queen Elizabeth Central Hospital
Dr Nedson Fosiko	Medical Doctor	Queen Elizabeth Central Hospital
Dr Samson Mndolo	Anaesthesiologist	Queen Elizabeth Central Hospital
Dr Singatiya Stella Chikumbanje	Anaesthesiologist	Queen Elizabeth Central Hospital
Dr Judith Mkwaila	General Surgeon	Mzuzu Central Hospital
Dr Steve Kateta	Internal Medicine Registrar	Queen Elizabeth Central Hospital
Dr Nomsa Kafumba	Obstetrician	Kamuzu Central Hospital
Dr Christiane Boecker	Development Worker	GIZ
Mr Cyril Goddia	Chief Anaesthetic Clinical Officer	Queen Elizabeth Central Hospital
Mr Robert Milazi	Nursing Officer	Kamuzu Central Hospital
Ms Gloria Mpachika	Anaesthetic Clinical Officer	Zomba Central Hospital
Mr Dickson Mambulu	Chief Clinical Officer	Zomba Central Hospital
Mr Joseph Wu	Technical Advisor	Luke International (Norway)
Dr Peter Chaziya	Paediatric Surgeon	Mzuzu Central Hospital
Dr Rudi Thetard	Chief of Party	ONSE Project
Dr Paul Dealmans	Technical Advisor	GIZ
Dr Jones Kaponda Masiye	Deputy Director, Curative and Medical Rehabilitation Services	MOH
Dr Yankho Luwe	Assistant Director of Clinical Services	MoH
Dr Mulinda Nyirenda	Emergency Specialist	Queen Elizabeth Central Hospital
Dr Emilia Connolly	Chief Health Systems Policy Advisor	Partners In Health
Dr Luckson Dulie	Executive Director	Partners In Health

Dr Evrard Nahimana	Africa Regional Policy and Partnerships Advisor	Partners In Health
Mr Zachary Crawford	Government Accompaniment Program Associate	Partners In Health
Dr Paul D. Sonenthal	Associate Director of Inpatient Services	Partners In Health
Dr Shada Rouhani	Director of Emergency and Critical Care	Partners In Health
Mrs. Zoe Isaacs	Manager, UHC Financing & Planning	Partners In Health
Mr Kennedy Kanyimbo	Quality Management Officer	Quality Management Department
Mrs Evelyn Zimba	Country Director	NEST 360
Mr Harold Chimphepo	Head of PAM	MoH
Mr Kingston Mabutao	Pharmacist	Bwaila Hospital
Mr David Kulemera	Branch Manager, CMST Central	Central Medical Stores Trust
Mr Clifton Gondwe	Inspector	Medical Council of Malawi
Mrs Jean Nyondo	Economist	MoH
Mr. Gladstone Mchoma	Economist	MoH
Mr. Francis Zhuwao	Economist	MoH
Mrs Glenda Khangamwa	Deputy Director Human Resources	MoH
Mr Mabvuto Chawinga	Orthopaedic Clinical Officer	Kamuzu Central Hospital
Mr Steve Potani (late)	Architect	MoH
Mr Alfred Chalira	Deputy ARI Program Manager	MoH
Mr Oniuos Mtalimanja	Anaesthetic Clinical Officer	Kamuzu Central Hospital
Mrs Emelesi Mittochi	Assistant Director of Clinical Services	MoH
Mr Xipo Chirwa	Nursing Officer	Kamuzu Central Hospital

Annex 3: Proposed staffing cadres

The following tables propose essential staffing categories in Emergency Care and Critical Care and in Out-of-hospital care.

The exact number of staff in each category depends on the patient load, the number of beds, the number of procedures in theatre, the beds that are occupied, etc.

Staffing categories in emergency and critical care in district hospitals					
	emergency department	short stay and admission room	wards	HDU	theatres
emergency care specialist (bachelor anaesthesia or surgery or internal medicine)	head of unit must oversee the two departments and be around		The clinician in charge of HDU must be on call reachable	Specialist clinician as clinical lead in shift and on call for the wards, one per shift	Part of theatre team on call, composed of specialists in surgery, obstetrics, orthopaedic
clinicians minimum level CO	for every cubicle one	for every cubicle one	1 ward clinician, not ward round clinician assisted by juniors and trainees	trainees to be allocated also to HDU	Part of theatre team supplemented by trainees
nurses specialized in EC	for every cubicle one	for every cubicle one	on call from HDU	1 per shift per 4 filled beds	specialized nurses in theatre nursing, 2 per shift
nurse-midwives	for the cubicle that is reserved for obstetric gynaecology cases		Depending on beds for more critical patients one for 4 beds	1 per shift per 4 filled beds with Obstetric cases	called for every obstetric operation to take care of the new-born
patient attendant	enough to take care of the patient's need in transport, toilet etc.	enough to take care of the patient's need in transport, toilet etc.	2 per shift	2 per shift	theatre attendants responsible for counting instruments and compresses and for sterilization
radiology technician	assisting with PoC ultrasound, on call if the case load is low		on call	on call	
laboratory assistant	for PoC tests				
porter	at least 1			on call	on call
Cleaner	at least 1 per shift	1 per shift at least	1per shift	1 per shift	at least one per shift
counsellor/ social worker	must be on call		on call	on call	
physiotherapist			must come to ward daily	must come to ward daily	
Anaesthetist	on call for procedures		on call for premedication and post op checks	on call for premedication and post op checks	at least 2 per shift, one doing premedication and assisting in emergency department
Biomedical engineer	On call	On call	On call	On call	On call
Clerks	Must be available 24h	Could be eventual same as in ED		Day shifts 1	Day shifts 1
Nutritionist			on call for wards	on call	

Staffing categories in emergency and critical care in central hospitals						
categories	emergency department	short stay and admission room	wards	HDU	ICU	theatres
emergency care specialist	head of unit	head of unit	the clinician in charge of HDU must be on call reachable	specialist clinician as clinical lead in shift and on call for the wards, one per shift	head of unit	part of theatre team on call, composed of specialists in surgery, obstetrics, orthopaedic
clinicians minimum level CO	for every cubicle one	for every cubicle one	1 ward clinician, not ward round clinician assisted by juniors and trainees	trainees to be allocated also to HDU	several plus trainees	part of theatre team supplemented by trainees
nurses specialized in EC	for every cubicle one	for every cubicle one	on call from HDU	1 per shift per 4 filled beds	1 per bed	specialized nurses in theatre nursing, 2 per shift
nurse-midwives	for the cubicle that is reserved for obstetric gynaecology cases		depending on beds for more critical patients one for 4 beds	1 per shift per 4 filled beds with Obstetric cases	1 per bed for filled obstetric beds	called for every obstetric operation to take care of the new-born
patient attendant	enough to take care of the patient's need in transport, toilet etc	enough to take care of the patient's need in transport, toilet etc	2 per shift	2 per shift	1 for 4 beds	theatre attendants responsible for counting instruments and compresses and for sterilization
radiology technician	assisting with PoC ultrasound, on call if the case load is low		on call	on call	on call	
Biomedical engineer	on call		on call	on call	on call	on call
laboratory assistant	for PoC tests				1 per shift	
clerks	If possible 24 hours and IT literate			1 day shift	1 per day shift	1 per day shift
porter	at least 1			on call	1 per shift	on call
cleaner	at least 1 per shift	1 per shift at least	1per shift	1 per shift	2 per shift	at least one per shift

Out-of-hospital care, first attenders, prevention and follow-up care			
Categories	scene- community	health centre	transport
trained first providers	several community providers	all Staff	drivers
emergency care technicians	some trained in communities	medical assistants should have the knowledge	1 per ambulance several when call for mass casualty
emergency care professionals		family care team should have the training	goes with ambulance when needed and supervise teams
health surveillance assistant		linked to family health team	
nutritionist		in the team of family health somebody should be trained	
physiotherapist		in the team of family health somebody should be trained	
Clerks	In the call centre, several 24/7	needed	Only in call/ coordination centre

Annex 4: Basic equipment for hospitals

Name of equipment	emergency ward	short stay	theatre	ward	HDUs	ICU
sterilizer	for emergency ward and short stay		autoclave	labour ward should have own	should have own or in districts or share with labour ward	should have own
sterilizing drums	2-3 in every cubicle	2-3 in every cubicle	enough for 7 days autonomy	2-3 in every ward	10 in every ward, more in labour ward and surgical	enough for 3 days autonomy
ventilator fan	in every cubicle	in every cubicle	has air-condition	3 per ward	ideally air conditioned if not per bed 1	Air conditioned
heater	1-2 for shock patients			1-2 per ward		
electrical blankets						at least 2
beds with adjustable head	more examination couches and stretchers	All	in recovery room and preparation room	ideally all	all	all
stretchers	for every patient and reserve		for carrying patients	1-2 for carrying patients	1-2 for carrying patients	1-2 for carrying patients
wheel chairs	many	several		1-2		
screen four-fold	some	some		4-5 for procedures on bed	better curtains	better curtains
portable ultrasound	1 or 2			should be accessible in each ward, 1 for labour ward	1	1
Mobile X ray						1
anaesthesia machine	in procedure room		in each theatre plus back-up			
scales adult	yes			1 per ward preferable without batteries	yes	yes
scales children	yes			in paediatric	yes	yes
focused light source Penlight	in every cubicle	in every cubicle	theatre lights in every theatre plus backup	2 per ward	every bed	very bed
examination couches	in every cubicle			1 per ward		
examination couch gynaecology	in 1-2 cubicles			in maternity and labour ward		
defibrillator	1		1	ideally one per ward	1	1
Caesarean section sets			enough for 5 days average			
laparotomy sets			enough for 5 days average			

big abdominal set			only central hospitals			
laryngoscope	1		several in each theatre different sizes	1 per ward different blades	several	several
Pulse oximeter	1 extra and in monitor	1 extra and in monitor	2 extra and in monitors	2 per ward	1 extra and in monitors	1 extra and in monitors
Vital signs Monitor	every cubicle and 2 spares	every cubicle and 2 spares	every theatre, every bed in recovery room and 2 spares	2 for the ward to monitor sicker patients		
Magill forceps	for laryngoscopes	for laryngoscopes	for laryngoscopes	for laryngoscopes	for laryngoscopes	for laryngoscopes
Suction machine manual	2 back ups	2 back ups		2 at least per ward	back-up	back-up
suction machine electric	with piped O2	with piped O2	every theatre room and recovery bed	2 per ward	with piped o2	with piped O2
guedel tube	all sizes every cubicle	all sizes every cubicle	all sizes every theatre and recover room	2 sets per ward	all sizes per bed	all sizes per bed
Oxygen concentrator	piped O2	piped O2	piped O2 in recovery and preparation, on anaesthesia machine in each theatre	4 10 litres for adults and 4 5 litres for children	piped O2 every bed	piped O2 every bed
Oxygen cylinder	backup	backup	backup	backup	backup	backup
cricothyroidotomy set	at least 2		at least 4	1 for wards	1 per unit	1 per unit
Ambubag adult	many	many	many	many	many	many
Ambu-bag child	many	many	many	many	many	many
adult masks	many	many	many	many	many	many
infant masks	many	many	many	many	many	many
neonate masks	many	many	many	many	many	many
capnograph	in central hospitals		in central hospitals			1
Blood gas Analyser	in central hospitals		in central hospitals			1
bronchoscope	in central hospitals					1
CPAP BIPAP	2 in district hospitals in central hospitals more		in recovery room and within theatre		every bed	every bed
ventilators	1 in DH, 1 per cubicle in CH		anaesthesia machine and one in recovery room		1	every bed
nebulizer machine	in every cubicle	in every cubicle		at least 1 per ward	2 per unit	2 per unit
syringe pumps	every cubicle 2 and spares	every cubicle 2 and spares	in every theatre 2 and 2 per bed in recovery	4 per ward	5 per bed	5 per bed

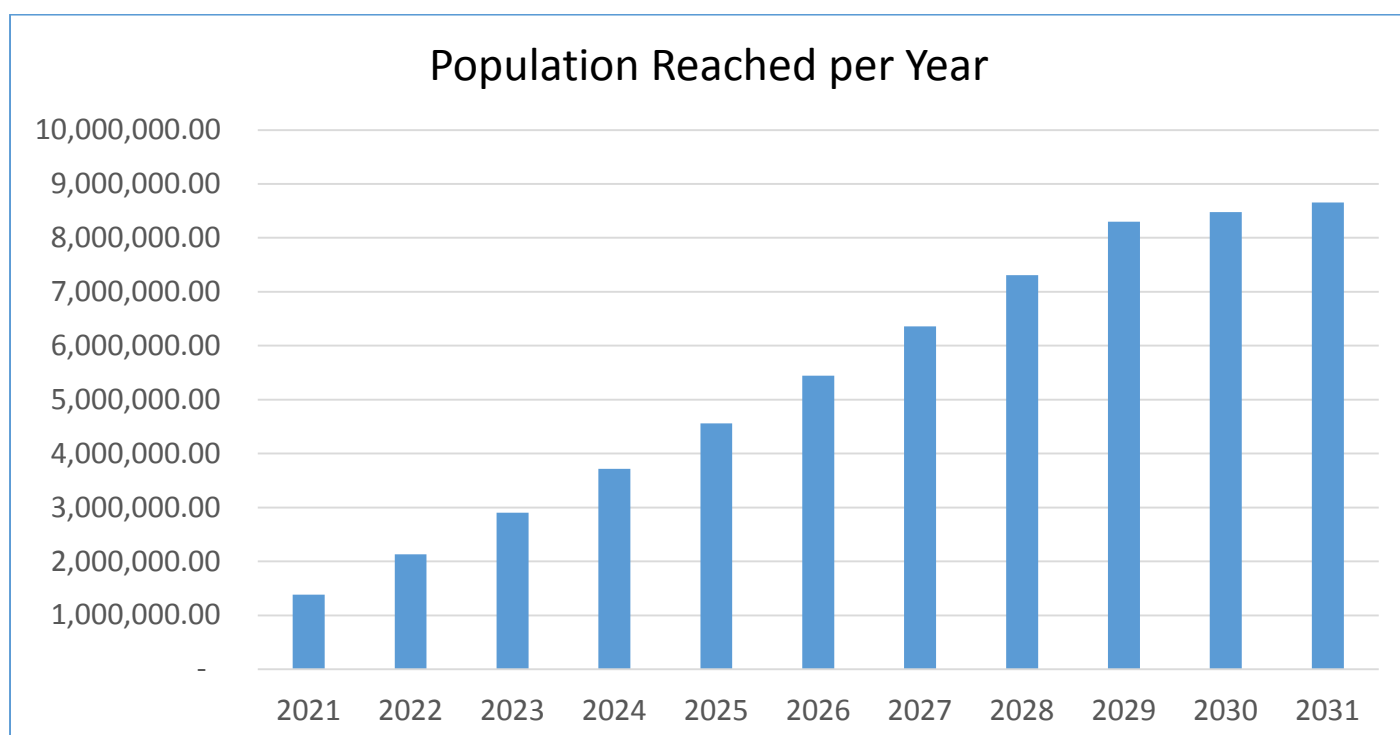
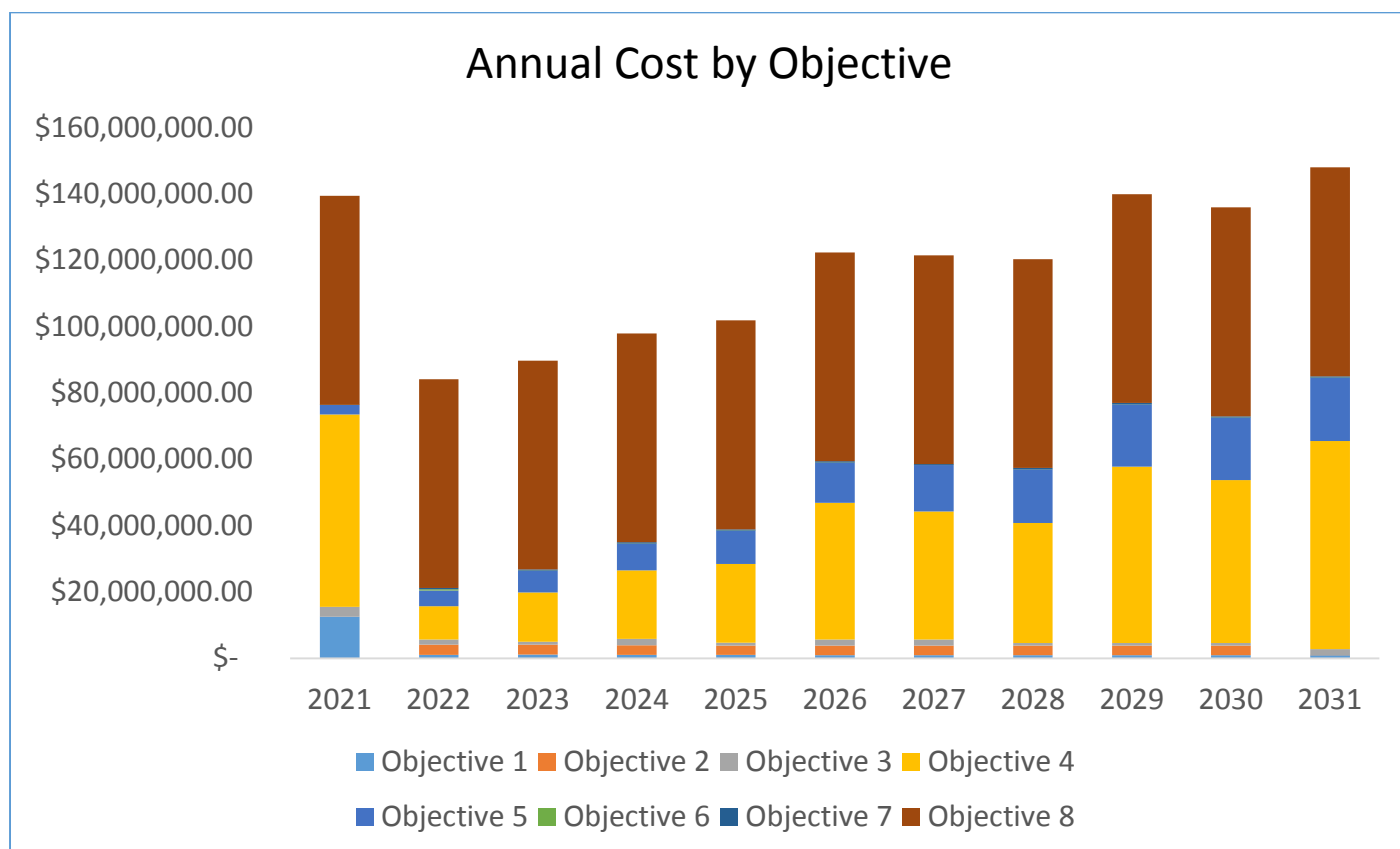
12-lead ECG	1			internal medicine 1		1
glucometer	every cubicle and spare	every cubicle and spare	in every theatre and recovery room 1	every ward 1-2	1-2 per ward	1-2 per ward
electrolyte counter	1 central hospitals					
FBC machine	1 central H					
sterile wound suture sets	several	several	big sets	in surgery	1	1
Traction Splints for femur fracture	several					
Rigid splints	several					
Arm slings	several					
Crutches				several		
Walking frames					several	several
Hand drill	1		backup			
Spinal immobilisation board	2					
Traction apparatus like weight, string, spreader	2		2	in surgical		
rigid cervical collars	several					
external fixation set	several		several			
basic orthopaedic set	2		several			
delivery set	several		several	in labour ward		
episiotomy set				in labour ward		
cervical suture set	several			in labour ward		
NASG	several					
foetal doppler	at least 2			3 in labour ward and maternity		
MVA set	several		several			
curettage set	several		several			
otoscope	several			in each ward 1	1	1
ophthalmoscope	several			accessible	1	1
haemodialysis machine slow rate		eventually in short stay				1

Annex 5: Cost Estimate for ECCS Implementation

Cost Summary by Cost Driver												
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Meeting Costs	\$ 50,226	\$ 1,521,848	\$ 1,349,405	\$ 819,749	\$ 1,004,824	\$ 974,537	\$ 594,341	\$ 606,060	\$ 941,814	\$ 560,096	\$ 555,834	
Salaries	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	
Medicine	\$ 2,946,746	\$ 4,551,041	\$ 6,243,984	\$ 8,029,504	\$ 9,907,153	\$ 11,882,234	\$ 13,952,996	\$ 16,126,576	\$ 18,399,586	\$ 18,793,278	\$ 19,186,969	
Consumables	\$ 8,690,259	\$ 9,867,246	\$ 14,640,615	\$ 20,597,328	\$ 23,444,415	\$ 29,175,706	\$ 38,443,848	\$ 36,084,517	\$ 44,313,590	\$ 49,098,745	\$ 50,752,818	
Equipment	\$ 49,296,568	\$ -	\$ 15,970	\$ -	\$ 15,970	\$ 11,825,304	\$ 15,970	\$ -	\$ 8,781,445	\$ -	\$ 11,841,273	
EMR	\$ 3,020,818	\$ 1,523,228	\$ 837,701	\$ 1,863,141	\$ 837,701	\$ 1,863,141	\$ 1,863,141	\$ 837,701	\$ 837,701	\$ 837,701	\$ 1,863,141	
Infrastructure	\$ -	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	\$ 2,841,370	
Ambulance	\$ 12,470,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	\$ 870,000	
Total	\$ 139,428,525	\$ 84,128,641	\$ 89,752,952	\$ 97,975,000	\$ 101,875,341	\$ 122,386,199	\$ 121,535,574	\$ 120,320,132	\$ 139,939,414	\$ 135,955,097	\$ 148,023,944	

Cost Summary by Objective												
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Objective 1	\$ 12,478,371	\$ 1,016,721	\$ 1,127,675	\$ 1,051,270	\$ 993,282	\$ 908,050	\$ 911,855	\$ 908,050	\$ 908,050	\$ 908,050	\$ 908,050	
Objective 2	\$ -	\$ 3,088,695	\$ 2,945,018	\$ 2,876,224	\$ 2,876,224	\$ 2,887,791	\$ 2,876,224	\$ 2,876,224	\$ 2,887,791	\$ 2,876,224	\$ 5,175	
Objective 3	\$ 3,026,906	\$ 1,553,972	\$ 913,192	\$ 1,881,862	\$ 837,701	\$ 1,863,141	\$ 1,863,141	\$ 837,701	\$ 837,701	\$ 837,701	\$ 1,863,141	
Objective 4	\$ 57,997,481	\$ 10,046,082	\$ 14,902,388	\$ 20,748,007	\$ 23,761,742	\$ 41,275,730	\$ 38,589,189	\$ 36,200,190	\$ 53,209,186	\$ 49,164,192	\$ 62,696,826	
Objective 5	\$ 2,952,834	\$ 4,731,550	\$ 6,484,155	\$ 8,053,856	\$ 10,073,051	\$ 12,118,144	\$ 13,993,786	\$ 16,164,626	\$ 18,763,344	\$ 18,835,589	\$ 19,217,409	
Objective 6	\$ 19,025	\$ 389,936	\$ 38,507	\$ 32,419	\$ 1,979	\$ 1,979	\$ 1,979	\$ 1,979	\$ 1,979	\$ 1,979	\$ 1,979	
Objective 7	\$ -	\$ 347,777	\$ 388,110	\$ 377,456	\$ 377,456	\$ 377,456	\$ 345,494	\$ 377,456	\$ 377,456	\$ 377,456	\$ 377,456	
Objective 8	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	\$ 62,953,908	
TOTAL	\$ 139,428,525	\$ 84,128,642	\$ 89,752,952	\$ 97,975,001	\$ 101,875,342	\$ 122,386,199	\$ 121,535,575	\$ 120,320,133	\$ 139,939,414	\$ 135,955,098	\$ 148,023,944	

Annex 6: Annual Costs & Population Reached



Annex 7: Costing Methods and Assumptions

Overall approach:

- We took a microplanning approach to costing, using an ingredients-based model to cost out activities, strategies, and objectives from the ECC Strategic Plan
- Costs do not include inflation
- All costs are in USD (\$)

Infrastructure, Salaries, EMR, Medicines, Consumables, Meetings Costs and Equipment were micro-costed using the following methods and assumptions:

Infrastructure:

- Utilized costs derived from PIH implementation in multiple sites.
- Costs include:
 - 20 bed emergency care unit
 - 10 bed short stay
 - 8 bed ICU/HDU
 - 2 bed operating theatre
- Assumed 20% of district hospitals will require new construction
- Assumed 80% of district hospitals will require refurbishment
- Assumed 100% of district hospitals will require refurbishment
- Replacement or major renovations are necessary in: Zomba Central Hospital, Dowa, Kasungu, Ntcheu, Balaka, Chikhwawa and Dedza District Hospitals
- Construction of new hospitals is needed in Lilongwe, Blantyre, and Zomba districts.

Medicines:

- Medicines were costed using a population and prevalence approach
- Prevalence data was sourced from IHME data for Malawi
- Annual population growth data was sourced from the *Population Projections 2018-2050 Report*, National Statistical Office, Malawi.
- In order to predict service utilization, we assumed that 40% of population at risk will access emergency services.
- In order to scale service delivery, we are targeting 20% of the care seeking population from year 1, growing by 10% per year until 100% of care seeking population is reached.
- Cost data was sourced from International Medical Products Price Guide (MSH), and the cost year for all drugs is 2015.
- Drugs were priced by average cost per dose per person, and average doses per person per year for each prevalence group

EMR:

- EMR costing was conducted in partnership with Luke International
- Costs represent capital expenses (year 1), as well as recurring costs for staff and replacement equipment

Salaries:

- Salary costs were sourced from MoH Malawi
- Salaries include all existing cadres as well as new cadres (hired incrementally)

Meeting Costs:

- Meeting costs were sourced from PIH Malawi
- An average of \$152 per person per day per meeting was assumed, which includes transportation, meals, lodging, room rental, and other meeting materials

Equipment:

- Equipment costs were sourced from PIH Malawi
- Equipment was allocated per district hospital, primary care setting, and central level hospital in order to calculate the amount needed per year
- Replacement equipment was identified and calculated to be replaced on a 2 or 5-year basis, depending on depreciation
- Equipment is quantified based upon the needs of every hospital in the country

Consumables:

- Consumables were costed based upon emergency service utilization across the total population at risk
- In order to predict service utilization, we assumed that 40% of population at risk will access emergency services.
- In order to scale service delivery, we are targeting 20% of the care seeking population from year 1, growing by 10% per year until 100% of care seeking population is reached.
- Costs for consumables were sourced from PIH Malawi
- Unit costs were multiplied by average cost per unit and average units used per person
- We assumed that all consumables will be procured on a yearly basis